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State of California
The Resources Agency

DEPARTMENT OF WATER RESOURCES
Division of Operations and Maintenance

STATE WATER PROJECT ANNUAL REPORT OF OPERATIONS 1986

FEBRUARY 1990

Gordon K. Van Vleck
Secretary for Resources
The Resources Agency

George Deukmejian
Governor
State of California

David N. Kennedy
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FOREWORD

This is the thirteenth in a series of annual reports summarizing the water and energy operation of the California State Water Project. This report summarizes the operation of Project facilities during 1986, and includes revisions to the data published in the monthly "State Water Project, Operations Data".

John R. Eaton, Chief
Division of Operations and Maintenance

State of California

GEORGE DEUKMEJIAN, Governor

The Resources Agency

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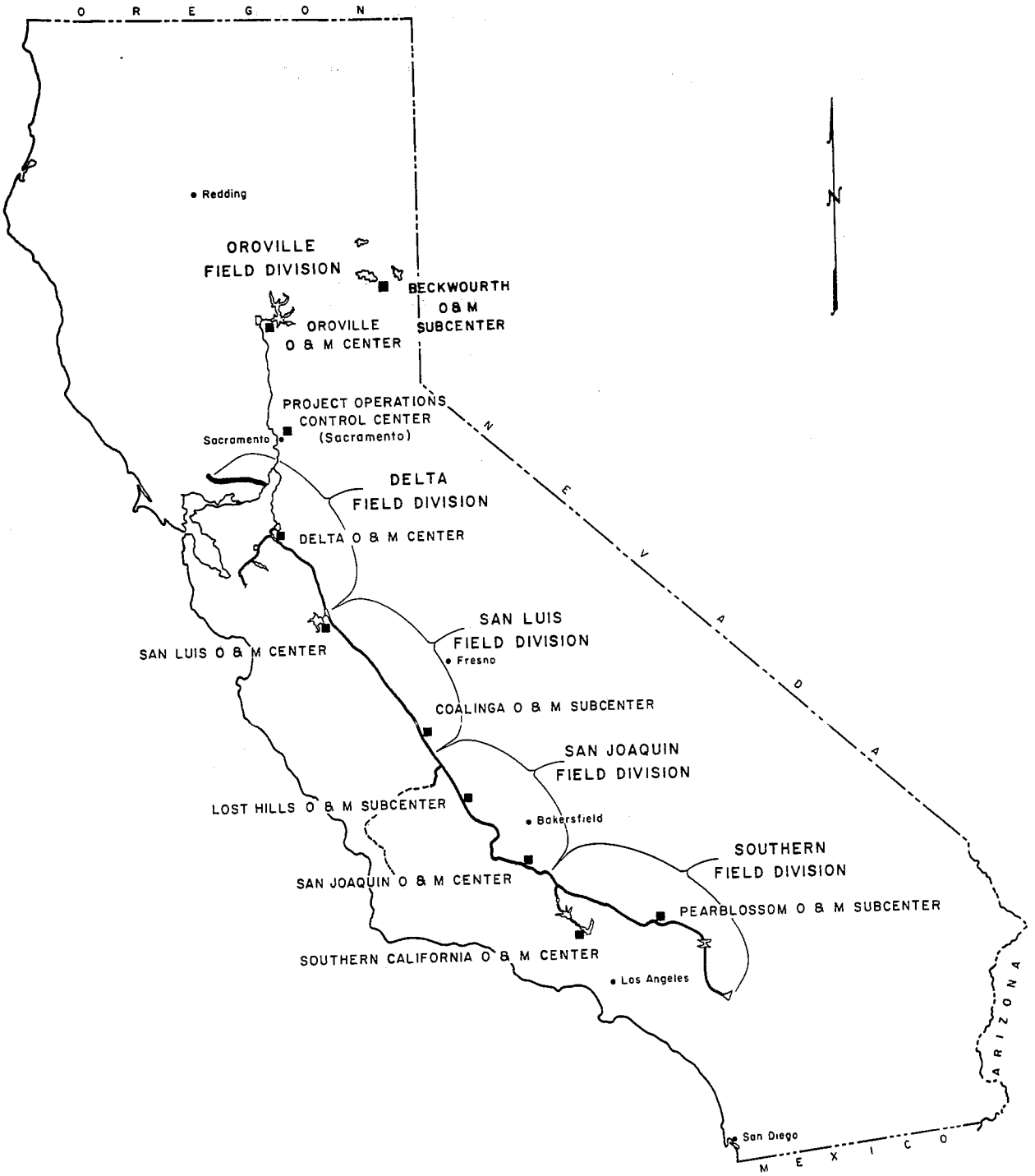
UNITS AND ABBREVIATIONS

In general, the use of units and abbreviations in this report follows the practice of spelling out a term in full at it's first use in each major section, followed by the abbreviated form in parentheses. The following names, terms and units in common use throughout the report are defined only at their first use in the report.

ft	feet
ac-ft	acre-feet
cfs	cubic feet per second
KW	kilowatt
KWh	kilowatt-hours
Kv	kilovolt
MW	megawatt
MWh	megawatt-hours
DWR	Department of Water Resources
SWP	State Water Project
USBR	U.S.Bureau of Reclamation
SWRCB	State Water Resources Control Board
D-1485	Water Rights Decision 1485
Banks Pumping Plant	Harvey O. Banks Delta Pumping Plant
California Aqueduct	Governor Edmund G. Brown California Aqueduct

MAP 1
FIELD DIVISION BOUNDARIES



INTRODUCTION

This 1986 Annual Report of Operations for the State Water Project (SWP) is divided into eight parts. The first two parts, "Introduction" and "Project Status in 1986," describe conditions and events of state-wide significance, in detail where appropriate and in summary when the item will be discussed in more detail in the following parts. The next four parts describe water quality, water conditions, water operations, and energy operations in 1986. The seventh part, "Sacramento-San Joaquin Delta Operations," gives special emphasis to Delta operations, a key aspect of the SWP. The last part, "Project Operations By Field Division," provides further detail on operational conditions and activities within each field division.

The report also includes three Appendices, tabulating Project operations in 1986. Appendix I describes aqueduct operations. Appendix II describes project pumping plants. Appendix III describes various types of water quality measurement analyses for selected stations throughout the Project.

HIGHLIGHTS OF 1986 OPERATION

Although the 1985-86 water year (October 1, 1985 through September 30, 1986) was a "wet" year in most of the State, California's water supply arrived in an erratic manner. Storms coming in the later part of January eased fears that this would be another below normal water year, and seasonal precipitation was close to normal over most of the State by the end of the month. Then a series of massive storms in mid-February changed the outlook from one of deficit to one of surplus. The mid-month storms were of such magnitude that several records were broken. Several streams experienced the highest February flows ever recorded and record monthly rainfall was noted at some stations. A large portion of an average year's water supply fell during a ten-day period in mid-February. Precipitation during March continued above normal in all areas of the State except the Colorado River area. April's precipitation was below normal in most areas of the State, recording only 60 percent of the amount usually expected during the month for the State as a whole. Total precipitation for the whole water year was well above average. Total water year runoff was also well above average, while reservoir storage amounts were slightly above average State-wide, except the North Coast reservoirs that were just below average.

Demand for SWP water almost equalled 1985 amounts. Deliveries of entitlement water to long term contractors were the second highest on record (1985 entitlement delivery total being the highest amount on record), and were only about 1,700 ac-ft less than 1985 total entitlement deliveries. In December of 1985, the approval of 80,840 acre-feet (ac-ft) of agricultural water was deferred until February of 1986.

For the third consecutive year, and the fifth out of the last seven in this decade, balanced water conditions were declared. The Department of Water Resources (DWR) and the United States Bureau of

Reclamation (USBR) declared balanced water conditions from June 21 through August 5, 1986. During balanced water conditions, each agency adjusts it's reservoir storage withdrawals and Delta exports to meet it's share of in-basin uses and Delta outflow.

The newly constructed Alamo Powerplant was provisionally released for operation on July 1, 1986. The unit was limited to a minimum of six megawatts (MW), or 600 cubic feet per second (cfs), and to a maximum of 17.5 MW (1,750 cfs) because of vibration below and above these limits. The unit's capability at 115 percent of rated output is 19.7 MW (2,050 cfs).

Enlargement of the East Branch of the Governor Edmund G. Brown California Aqueduct began in 1986. Construction work would include enlarging the canal from Alamo Power Plant to the Mojave Siphon, installing additional barrels at 15 siphons, installing additional pumping units and discharge lines at Pearblossom Pumping Plant, and installing additional turbine-generator units at Devil Canyon Powerplant and a second afterbay. On July 15, DWR sold $132 million of Water System Revenue Bonds, Series A, to help fund the East Branch enlargement construction. This was the first sale of water system revenue bonds (all prior revenue bonds were for power facilities).

Thermalito Afterbay Dam was modified in several ways. Corner reinforcement was installed on the Southwest corner to reduce the potential cracking failure during an earthquake. A small fill was placed on a portion of the West side toe to avoid seepage ponding along that area. A permanent pressure relief system was installed on the South side of the dam to lower the seepage pressure at the downstream toe of the dam. The pressure relief system consisted of a series of perforated wells, 20 feet (ft.) deep and 50 ft. apart, feeding to a collector drain and sump pumps. The success of the system was tested from December 8 to 20, 1986, when Thermalito Afterbay storage was maintained at higher levels with a significant reduction in the seepage pressure.

DWR and the Department of Fish and Game signed a Delta fish protection agreement on December 30, 1986. This agreement provided measures to offset direct losses of fish caused by SWP operation of the Harvey O. Banks Delta Pumping Plant (Banks Pumping Plant). This agreement also cleared the way for the installation of four additional pumps at Banks Pumping Plant.

PROJECT STATUS IN 1986

PROJECT FACILITIES

The SWP conserves water for distribution to much of California's population and to agricultural irrigation. It also provides flood control, water quality control, electrical power generation, new recreational opportunities, and enhancement of sport fisheries and wildlife habitat.

The first SWP facilities to become operational were Frenchman Dam and Lake in the Upper Feather River area and the South Bay Aqueduct in the San Francisco Bay area in 1962. By 1973, construction of the initial facilities of the SWP was complete. This provided for operation of the entire SWP from Plumas County in the north to Riverside County in the south. Additional facilities added later to the Project were: William E. Warne Powerplant began generation on November 17, 1982; Reid Gardner Unit No. 4 (a coal-fired unit owned jointly with Nevada Power Company) began generation on July 26, 1983; Bottle Rock Powerplant (a geothermal plant) began generation on February 26, 1985; and Alamo Powerplant began generation on July 1, 1986.

Facilities in operation during 1986 included: 22 reservoirs with a gross capacity of 6,797,171 ac-ft; nine powerplants with a total output capacity of 1,939 MW[1/]; 16 pumping plants housing 112 units with a total motor rating of 2768 MW[2/]; and 537 miles of aqueduct. During 1986, water was delivered from SWP facilities to:

* 24 State long-term water service contractors.
* 4 Agencies receiving recreation water (Department of Fish and Game, Department of Parks and Recreation, East Bay Regional Park District, and the Los Angeles County Recreation Department).
* Several local agencies and farmers receiving water to satisfy prior water rights.
* 4 Local agencies receiving other water.

In addition, SWP facilities were used to deliver a total of 1,389,235 ac-ft of federal water for USBR.

MAJOR OUTAGES AND OPERATING LIMITATIONS

Major outages and operating limitations of SWP facilities during 1986 were:

---

1 Includes 202 MW of federal power generation output at William R. Gianelli Pumping-Generating Plant, and excludes 1,036 MW from Castaic Powerplant for Los Angeles Department of Water and Power and 15 MW from Reid Gardner Unit No. 4 for Nevada Power Company.

2 Includes 261 MW of federal pumping capacity at William R. Gianelli Pumping-Generating Plant and Dos Amigos Pumping Plant.

* Reid Gardner Unit No. 4 was out of service from February 2 through 13 for preventive maintenance. On February 14, the unit was brought back into service for testing and then was shut down that same day. It remained out of service until mid-April for economical reasons as record storms provided abundant hydro power at a lower cost than power produced at Reid Gardner. During the outage period, DWR sold 25 MW to Nevada Power Company at their production cost to make up for the amount of energy not available to them with Unit No. 4 out of service. The unit was out of service again from November 9 to 25 for fall maintenance.
* The Castaic intake tower was out of service from February 3 to 10 to repair a hydraulic oil leak. The Metropolitan Water District of Southern California received water from the Los Angeles Department of Water and Power during this period.
* On September 22 and 23, and again on 29 and 30, the elevation at Thermalito Afterbay was limited to a maximum of 125.00 ft. during the day (6AM to 6PM) to allow for the placement of riprap on the inside face of the embankment at the southwest corner of the dam. The work was done to make the structure more earthquake resistant, and was completed on October 14.
* On September 26, the 230-kilovolt(kv) inter-connection between DWR's Oroville-Thermalito-Table Mountain No. 1 line and Western Area Power Administration's Cottonwood-Elverta No. 3 line was severed. The inter-connection began operation on May 19, 1983, to help relieve transmission overloading between Table Mountain and Tesla Substations until the installation of series capacitors called for in the DWR-Pacific Gas and Electric Company (PGandE) Comprehensive Agreement. PGandE approved increased transfer capability on the transmission between these substations in January of 1986, lessening the chances of future curtailment on this section of the PGandE backbone. The inter-connection was left in until September 26 at PGandE's request. PGandE paid costs incurred since May 1, to help reduce overloading in other areas of the PGandE system.
* The Angeles Tunnel slide gate was taken out of service on October 1, for routine fifth-year maintenance. The slide gate was out of service until mid-November. During this period there was no emergency closure capability to shut off water to the Angeles Tunnel.
* Because of some embankment settlement along the Lower Quail Canal, water flow in the canal was restricted,beginning October 25, to a maximum water surface elevation of 3315.00 ft. and a minimum elevation of 3310.00 ft. Cracks in the soil and voids behind the concrete lining caused by the settlement were filled with bentonite slurry. On December 9, the maximum water surface elevation was raised to 3317.00 ft. The water level in the canal was raised while monitoring the embankment for any further movement continued.

WATER QUALITY STANDARDS

D-1485, adopted by the SWRCB in August 1978, established water quality standards for the Sacramento-San Joaquin Delta and Suisun Marsh. As described in more detail under "Sacramento-San Joaquin Delta Operations" Section, (Page 27) all D-1485 standards were met in 1986 by comfortable margins, although an early "wet" water year classification for 1985-86 brought into effect the most restrictive water quality standards under D-1485. The North Delta Water Agency contractual electrical conductivity standards at Emmaton on the Sacramento River were also met in 1986.

Article 19 in the SWP water supply contract establishes water quality objectives, which are based upon the expected construction of an efficient cross-Delta transfer system. Some of these objectives were exceeded in 1986. The sodium objective (not to exceed 50 percent of all cations) was exceeded by 2 to 14 percent at most stations along the California Aqueduct, especially in January directly following the previous dry year. This objective was also exceeded at a few of the stations in February and during several spring and fall months. At Thermalito Forebay and eight stations along the Aqueduct, the phenol objective (0.0001 mg/l) was exceeded generally by 0.0001-0.008 mg/l early in the year and again later in the fall. At check 29 the phenol objective was exceeded by 0.018 mg/l. The iron plus manganese objective of 0.3 mg/l was exceeded by 0.3-2.7 mg/l at Lake Davis and three stations along the Aqueduct in August and September 1986. Finally, at Pearblossom Pumping Plant, the chloride objective (110 ng/k) was exceeded by 4 percent in January.

Figure A on Page 6 shows the mean daily chloride levels at three Delta stations: Cache Slough, Contra Costa Canal Intake, and Tracy Pumping Plant. Figure B on Page 7 shows the mean daily electrical conductivity at several SWP locations. Also, Appendix III presents various types of water quality data for selected stations throughout the SWP in tables 21 through 38. Table 39 tabulates the minimum detection concentrations for tested substances and the different types of pesticides detected in the California Aqueduct.

FIGURE A: MEAN DAILY CHLORIDE LEVELS AT DELTA STATIONS
1986

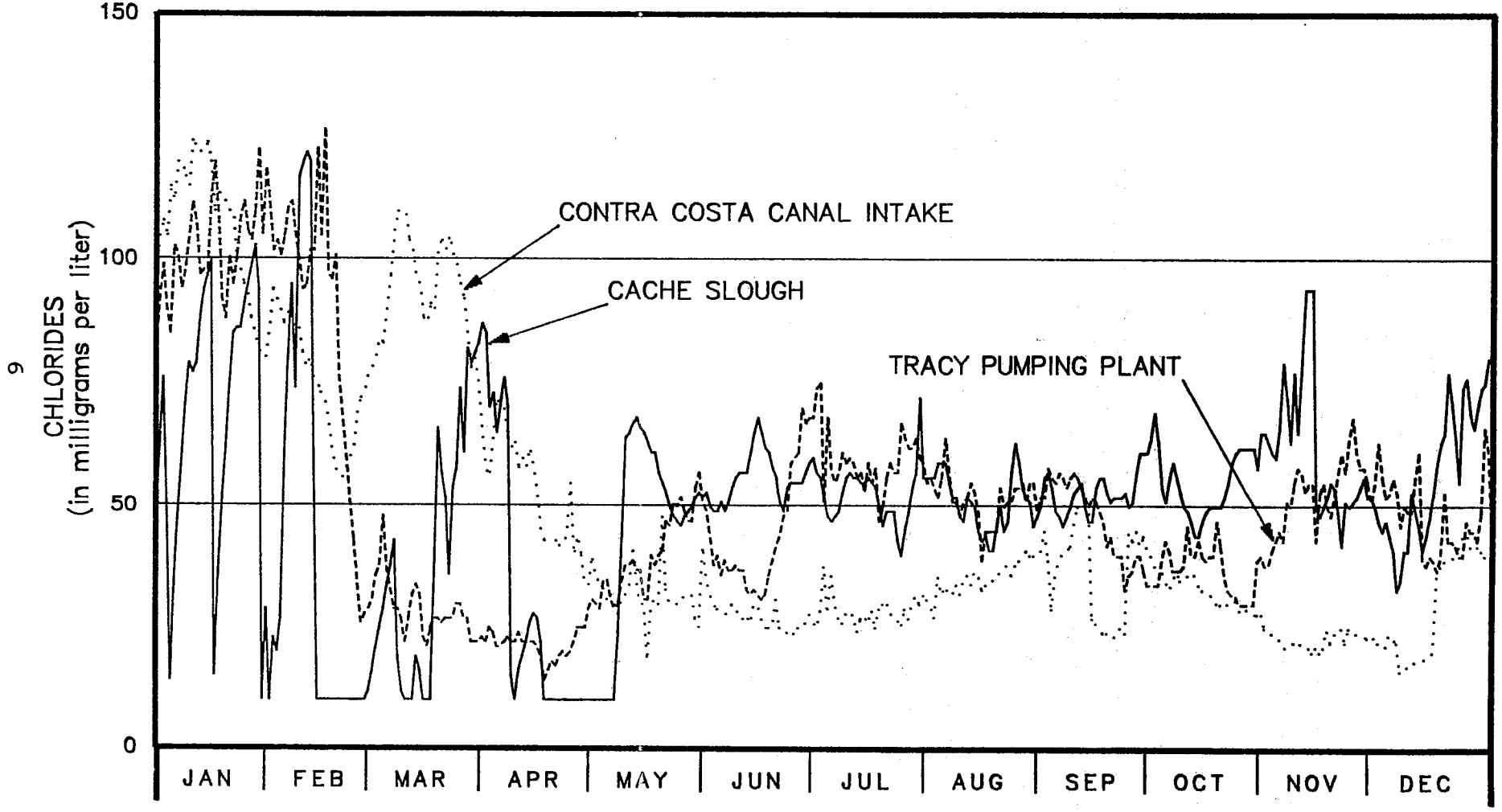
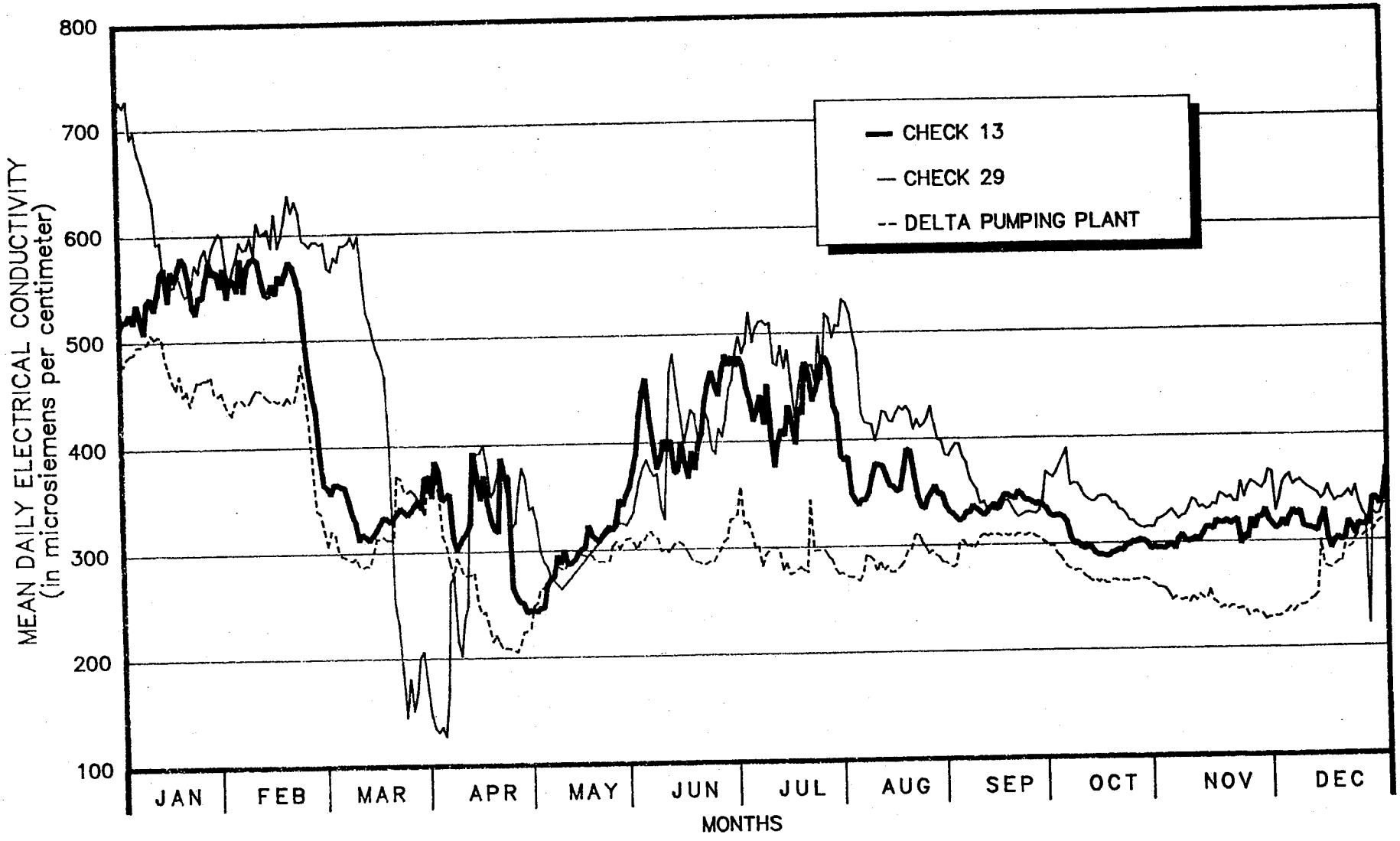


FIGURE B: MEAN DAILY ELECTRICAL CONDUCTIVITY AT SWP LOCATIONS 1/
1986



1/ Estimated values are shown for days when no data was available.

WATER SUPPLY CONDITIONS

Based on criteria in D-1485, the 1985-86 water year was classified as a "wet" year. The final determination of year classification is made in May, based on current water year forecasts of the "Sacramento River Index" (formerly known as the "Four Basin Index"), which is the sum of the Sacramento Valley's unimpaired runoff at the following four locations: Sacramento River above Bend Bridge, near Red Bluff; Feather River, total inflow to Lake Oroville; Yuba River near Smartville; and the American River, total inflow to Folsom Lake. The May 1 forecast (and actual, in parentheses) of unimpaired runoff for these basins was 26,080,000 (25,734,700) ac-ft for the 1985-86 water year, which was 148 (146) percent of average for the four basins [3]. In addition, the May 1 forecast designated the 1985-86 water year as a "subnormal snowmelt" water year because the forecast of April through July unimpaired runoff (5.77 million ac-ft) was less than the 5.9 million ac-ft defined in D-1485. This determination reduced the required average Delta Outflow Index in May, June and July under D-1485 substantially.

Actual unimpaired runoff for the 1985-86 water year was well above average throughout California. Unimpaired runoff state wide for the water year was 149 percent of average, ranging from 107 percent of average in the South Coastal hydrographic area to a high of 213 percent of average in the San Francisco Bay area. Total volume of actual runoff for the water year in the Central Valley was 57.9 million ac-ft.

In the Feather River basin, the primary source of water supply for the SWP, water year total precipitation was 156 percent of average, and the total unimpaired runoff for 1986 was 152 percent of average. Maximum snowpack water equivalent [4] was 86 percent of average.

State wide precipitation to May 1, during the 1985-86 water year, was 135 percent of average, compared with 85 percent of average for the corresponding 1984-85 period. Some of the hydrographic areas representing these conditions are:

Sacramento Valley	*140 % of average*
San Joaquin Valley	*140 % of average*
South Coastal	*120 % of average*

May 1 snow surveys showed snow-stored water amounts that were above average on most of the snow courses measured. Snowpack water equivalent measurements in Sacramento Valley watersheds were 75 percent of average. San Joaquin Valley watersheds were higher at 125 percent of average.

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3 Unimpaired runoff and precipitation averages are based on the 50-year period 1931-1980. Snowpack averages are based on the 50-year period 1936-1985.

4 Snowpack water equivalent is the amount of water, by weight, contained in snow, as determined by sampling of selected snow courses and remote sensors.

WATER OPERATIONS

RESERVOIR OPERATIONS

On January 1, storage in the principle SWP reservoirs (Lake Oroville, Lake Del Valle, San Luis Reservoir, Pyramid Lake, Castaic Lake, Silverwood Lake, and Lake Perris) was below average. The combined storage of these reservoirs on January 1 was about 1.66 million ac-ft below their combined operational capacity. At the end of 1986, this combined storage was about 0.67 million ac-ft more than the combined storage at the end of 1985. The following tabulation compares 1985 and 1986 year-end storage in the principle SWP reservoirs:

Reservoir	*Storage* 12/31/1985	12/31/1986
Lake Oroville	*2,097,874*	*2,564,058*
Lake Del Valle	*24,856*	*25,175*
*San Luis Reservoir**	*906,663*	*1,062,504*
Pyramid Lake	*160,188*	*163,942*
Castaic Lake	*270,611*	*299,168*
Silverwood Lake	*68,307*	*72,235*
Lake Perris	*115,512*	*123,851*
Total	*3,644,011*	*4,310,933*
Total difference	*+666,922*	

** SWP share.*

A detailed description of the individual reservoirs is presented in "Project Operations By Field Division", beginning on Page 36.

AQUEDUCT OPERATIONS

In 1986, a total of 1,389,235 ac-ft of Central Valley Project (CVP) water was delivered from the San Luis Joint-Use Facilities in the San Luis service area to federal customers in the San Joaquin Valley. The DWR operates and maintains the joint-use facilities, including the 102 miles of aqueduct between O'Neill Forebay and Kettleman City.

In the San Luis Field Division, between Mile Posts 115 and 158, over 7,000 ac-ft of local storm water flowed into the California Aqueduct during February, March, and the first two weeks of April. These side-flows into the Aqueduct have,in the past, carried substantial amounts of asbestos-laden sediment.

The amounts of asbestos inflow in 1986 were considerably less than the record 1983 inflows, minimizing effects on the Aqueduct.

On March 19, the SWP began taking excess San Joaquin Valley floodwater into the California Aqueduct via the Kern River Intertie. Flows through the Intertie stopped on April 9, after passing 15,580 ac-ft into the Aqueduct. During the period June 5 through 7, an additional 1,867 ac-ft flowed into the Aqueduct through the Intertie.

The DWR received approval from the United States Corps of Engineers and the East Bay Regional Park District to exceed the normal maximum operational capacity (39,914 ac-ft) of Lake Del Valle between Memorial Day and Labor Day by 2,000 ac-ft in the summer of 1986. This additional filling was in response to a request from South Bay Aqueduct water contractors to surcharge the Lake as a resource for alleviating possible water quality problems. Natural inflow was used to meet the target storage of 41,500 ac-ft on May 1. The first releases of the season of this surcharge water into the South Bay Aqueduct began on June 18.

Between July 5 and August 15, DWR completed pumping 123,566 ac-ft of D-1485 replacement water for USBR (see Page 47) at Banks Pumping Plant.

On September 9, DWR and the USBR entered into a temporary wheeling agreement to enable the delivery of water to the Kern National Wildlife Refuge. On October 20, DWR completed the wheeling of 4,000 ac-ft of CVP water from O'Neill Forebay though SWP facilities to the Buena Vista Water Storage District, which in turn delivered the water to the Refuge. DWR received payment from the United States Fish and Wildlife Service on behalf of the USBR for wheeling costs. Under the agreement, DWR may wheel up to 10,000 ac-ft of CVP water before the termination date of the agreement on February 28, 1987.

On December 5, a malfunctioning gate control caused water to overtop a turnout on the California Aqueduct near Kettleman City. Damage was minimal and was limited to the turnout lateral.

WATER DELIVERIES

Although 1985-86 water year was a "wet" year in most of the State, demands for SWP water in 1986 almost equalled that of the "dry" year of 1985. Deliveries of SWP entitlement water to long term contractors were the second highest on record (1985 was the highest on record). Project water supplies in 1986 were sufficient to meet all water service contractors' requests for SWP water deliveries.

The total amount of water delivered by the SWP in 1986 was 4,274,006 ac-ft. Included in this total: 2,045,674 ac-ft of SWP water (a 13 percent decrease from the 1985 amount); 796,500 ac-ft to satisfy prior water rights (listed on Page 37); 42,597 ac-ft of local supply water (a 45 percent increase over the 1985 amount); and 1,389,235 ac-ft of CVP water delivered by the SWP. The following table details the SWP

water deliveries made to long term contractors by water type. A discussion of the different types of deliveries follows the table:

Type	Amount (ac-ft)
Entitlement Water	1,958,466
Carryover Entitlement	37,170
Carryover Surplus	12,270
Surplus Water	2,316
1977 Emergency Relief Water	7,950
Pre-consolidated Repayment Water	1,603
Unscheduled Water	22,034
Recreation Water	3,425
Mitigation Water	440
Subtotal	2,045,674
Local Supply Water (non-project)	42,597
Total	2,088,271

During the spring of 1985, the lack of sufficient rainfall prompted fears of a possible drought similar to that experienced during the 1976-77 period. In September, to comply with rule curve procedures requiring a minimum carryover storage, DWR cancelled scheduled surplus water deliveries for October through December 1985. Precipitation continued below normal during Fall 1985, and in December, DWR deferred approval of a portion of the 1986 agricultural entitlement requests. During late 1985, precipitation delayed the harvesting of crops and the application of preirrigation water from the contractors' remaining 1985 deliveries. Also in December, 1985, agreements were executed to allow the carry over of 37,170 ac-ft of 1985 agricultural entitlement water and 12,270 ac-ft of 1985 agricultural surplus water for use during January and February of 1986. All entitlement and surplus water carried over from 1985 were delivered during January and February of 1986. Also, both agreements provided for contractor payment of any identified cost increase that was experienced by other SWP contractors or DWR as a result of activities under these agreements.

In September 1985, seven contractors submitted requests for a total of 453,924 ac-ft of surplus water during 1986. Because of the deferred approval of entitlement water in December 1985, DWR did not approve any surplus water deliveries until reinstatement of full entitlement water at the end of February 1986. Oak Flat Water District, Devils Den Water District (DDWD), and Dudley Ridge Water District (DRWD) received 2,316 ac-ft of surplus water in 1986. DRWD, Kern County Water Agency (KCWA), and Tulare Lake Basin Water Storage District (TLBWSD) took delivery of 1985 carryover surplus water totaling 12,270 ac-ft. Santa Clara Valley Water District (SCVWD) and Empire West Side Irrigation District (EWSID) requested, but did not take, 1986 surplus water.

2045674
796,500
42597
2884771
1389235
4274006

The 1977 emergency drought relief water program resulted in 95,176 ac-ft of undelivered exchange water being held in SWP reservoirs for emergency relief of future drought conditions. In 1978, when it became apparent that the 1976-77 drought was over, the stored water was sold. Two non-SWP contractors (Green Valley Water District and Tracy Golf and Country Club) purchased a total of 650 ac-ft of this stored water and took delivery in 1978 and 1979. Also in 1978, KCWA purchased the remaining 94,526 ac-ft for delivery before December 31, 1983. At KCWA's request, an agreement was made to extend the delivery deadline to December 31, 1986. On January 1, 1986, the balance was 7,950 ac-ft. KCWA took delivery of 6,247 ac-ft of this water and transferred the remaining 1,703 ac-ft to TLBWSD.

DWR entered into two contracts during 1964 to obtain water to pre-consolidate land within the right of way of the California Aqueduct. This water was to be paid back upon request after the Aqueduct began service. The contracts, which have changed hands over the years, are now held by Shell California Production, Inc., and the J. G. Boswell Company. The original contracts expired December 31, 1984. Agreements were completed in 1985 to extend the period for return of pre-consolidation water through December 31, 1994. During August and September, 1,603 ac-ft of pre-consolidation repayment water was delivered to Shell California Production, Inc. from unregulated flows in the Delta. The remaining balances are 22,086 ac-ft to Shell California Production, Inc., and 14,170 ac-ft to J. G. Boswell Company.

The combination of below average storage in Lake Oroville, forecasts indicating a better than 50 percent chance of below normal runoff, and temporary availability of excess water in the Delta in early 1986, precluded the availability of surplus water but lead to a situation where "unscheduled" water is available to SWP water service contractors. Unscheduled water is water in the Delta that can be diverted and is more than that required to meet Delta water quality requirements, SWP deliveries, and reservoir fill. Since the excess water in the Delta did not originate where it could have been stored in Lake Oroville,the State share of San Luis Reservoir was full, and the Southern reservoirs were full, it was available as "unscheduled" water. SCVWD, DDWD, EWSID, KCWA and TLBWSD requested and received 22,034 ac-ft of "unscheduled" water in 1986.

During 1986, a total of 4,016 ac-ft of recreation water was delivered as follows:

* 2,206 ac-ft for use at public recreation facilities at Lake Del Valle, San Luis Reservoir, O'Neill Forebay, Silverwood Lake, Pyramid Lake, Castaic Lake, and Lake Perris.
* 1,134 ac-ft to maintain a trout fishery in Piru Creek.
* 226 ac-ft to replace water losses at Castaic Lagoon.
* 440 ac-ft to the Department of Fish and Game.
* 10 ac-ft to the Department of Parks and Recreation.

SWP facilities are also used to transport non-Project water for long-term SWP contractors and other agencies under various agreements to honor local water rights. Some of this water simply passes through SWP facilities, and some is stored in SWP reservoirs to be released later in the year, under agreements by which water-right holders pay storage fees. The SWP reservoirs used for storing this type of water are Lake Del Valle and Castaic Lake. In 1986, a total of 39,078 ac-ft was delivered in this category to two long-term contractors and three other agencies, up 54 percent over the amount delivered in 1985. Also, a total of 3,519 ac-ft was delivered to Napa County Flood Control and Water Conservation District as Solano Project water.

The total amount of water delivered to federal customers from the joint-use facilities was 1,389,235 ac-ft in 1986, about 52 percent lower than deliveries made in 1985. This amount includes 377 ac-ft of federal recreation water, and 17,513 ac-ft of CVP water wheeled for the USBR by DWR.

Table 1 on Page 14, shows water deliveries from SWP facilities by years, with totals to date, for individual agencies. Figure C on Page 15, shows annual totals for California Aqueduct water deliveries. Water deliveries by field division are presented in Map 3 on Page 16.

TABLE 1: WATER DELIVERIES 1962-1986

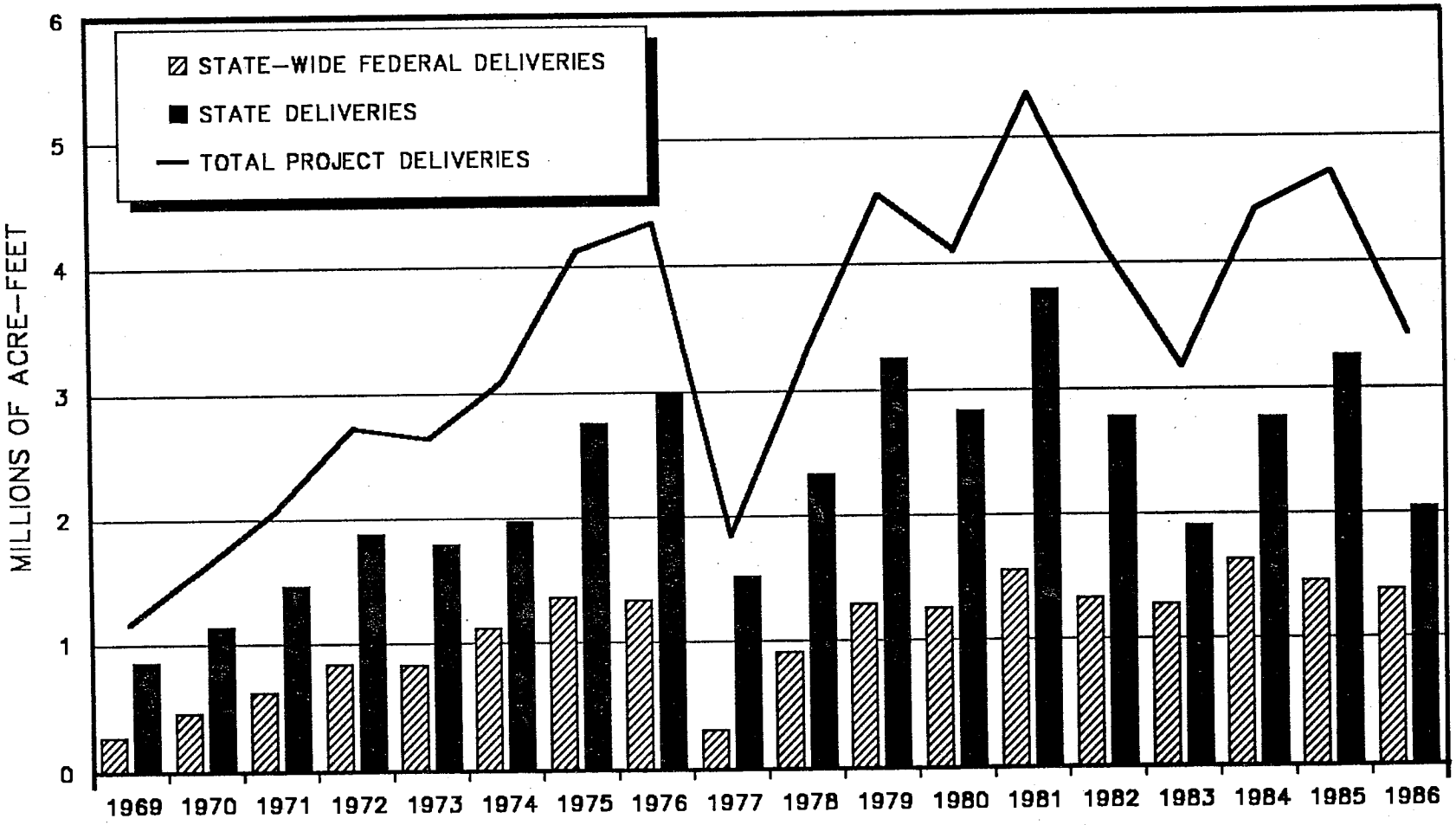
(in acre-feet)

AGENCY	1962-1981	1982	1983	1984	1985	1986	TOTALS
OROVILLE FIELD DIVISION							
LAST CHANCE CREEK W.D. 1/	95,791	10,499	9,073	13,782	13,117	14,379	156,641
PLUMAS CO. F.C. & W.C.D.	4,313	305	262	272	254	317	5,723
PALERMO CANAL 2/	109,322	6,493	6,761	6,850	7,195	7,970	144,591
COUNTY OF BUTTE	3,413	334	325	177	308	313	4,870
THERMALITO I.D. 1/	6,390	763	1,459	1,869	2,229	2,051	14,761
THERMALITO AFTERBAY 2/	11,026,981	754,260	594,409	822,721	861,554	786,489	14,846,414
UPPER FEATHER RIVER LAKES 2/	105,810	484	797	1,803 ~~2,626~~	2,019	2,041	~~113,777~~ 113,759
YUBA CITY	0	0	0	108	62	328	498
DELTA FIELD DIVISION							
NAPA CO. F.C. & W.C.D. 1/	72,880	1,213	2,287	2,923	4,039	3,519	86,861
ALAMEDA CO. W.D. 1/	331,549	15,383	12,470	13,723	22,289	21,170	416,584
ALAMEDA CO. F.C. & W.C.D., ZONE 7 1/	231,040	19,055	15,480	20,340	21,773	23,468	331,136
PLEASANTON TOWNSHIP W.D.	674	0	0	0	0	0	674
SANTA CLARA VALLEY W.D.	679,529	88,564	86,733	91,663	101,938 13/	90,595	1,138,022
MARIN W.D.	4,594	0	0	0	0	0	4,594
SAN FRANCISCO W.D.	4,345	0	0	0	0	0	4,345
SKYLONDA M.W.D.	10	0	0	0	0	0	10
OAK FLAT W.D.	81,297	4,865	3,822	7,344	6,197	5,354	108,879
MUSTANG W.D.	4,256 ~~42,556~~	0	0	0	0	0	42,556
TRACY GOLF & COUNTRY CLUB 3/	1,117	319	364	525	463	454	3,242
GRANITE CONSTRUCTION	120	0	0	0	0	0	120
LAKE DEL VALLE (E.B.R.P.D.)	702	129	132	158	152	130	1,403
ORESTIMBA CREEK	100	0	0	0	0	0	100
MUSCO OLIVE (C.V.P. water)	0	0	0	10	18	9	37
SOLANO CO. F.C.W.C.D.	0	0	0	0	0	1,400	1,400
SAN LUIS FIELD DIVISION							
DEPT. PARKS & REC. (STATE)	397	49	45	55	10	10	566
DEPT. FISH & GAME (STATE)	2,686	418	381	472	485	440	4,882
FED. CUSTOMERS (REC.+ JOINT-USE)	12,240,458	1,264,735	1,269,901	1,540,707	1,295,647	1,371,722	18,983,170
FED. CUSTOMERS (MISC.)	1,059	60,000	0	0	28,000	0	89,059
SAN JOAQUIN FIELD DIVISION							
TULARE LAKE BASIN W.S.D.	1,627,945	85,916	1,006	5,743	206,678	92,143	2,019,431
EMPIRE WEST SIDE I.D.	55,412	1,287	0	0	5,197	2,300	64,196
COUNTY OF KINGS	22,400	1,750	3,550	3,100	3,400	3,700	37,900
HACIENDA W.D. 4/	75,895	0	0	0	0	0	75,895
KERN CO. W.A.	8,883,545	895,193 10/	595,112	1,099,391	1,083,749	929,278 15/	13,486,268
DUDLEY RIDGE W.D.	755,867	55,463	55,919	64,600	62,009	51,152	1,045,010
DEVILS DEN W.D.	204,190	19,059	12,659	20,845 11/	18,194	17,271	292,218
J.G. BOSWELL 86,705	~~867,895~~	0	0	30,725	0	0	~~898,580~~ 117,430
SHELL CAL PROD. 6/	64,337	5,979	6,071	7,924	0	1,603	85,914
GREEN VALLEY W.D.	8,331	0	0	2,557	166	0	11,054
U.S.B.R. (FISH & WILDLIFE)	11,700	0	0	0	0	4,000	15,700
U.S.B.R. 5/	315,260	1,046	0	95,406	130,763	13,050 16/	555,525
WHEELER RIDGE W.S.D.	92	0	0	0	0	0	92
SOUTHERN FIELD DIVISION							
A.V.E.K. W.A.	326,938	50,291	32,961	32,662	37,064	32,449	512,365
M.W.D. OF S.C.	4,229,598	691,749	371,985	~~469,698~~ 12/ 457,582	729,209 14/	708,840	7,192,074
LITTLEROCK CREEK I.D.	4,800	0	38	1	0	163	5,002
MOJAVE W.A.	12,733	10,500 8/	34,356	0	0	0	57,589
DESERT W.A.	108,300	21,000	23,000	25,000	27,000	29,000	233,300
COACHELLA VALLEY W.D.	69,936	13,326	14,547	15,768	16,989	18,210	148,776
CRESTLINE-LAKE ARROWHEAD W.A.	9,681	1,238	911	1,128	1,422	1,506	15,886
SAN GABRIEL VALLEY M.W.D.	33,894	12,589	734	7,856	5,028	9,454	69,365
SAN BERNARDINO VALLEY M.W.D.	122,086	14,137 9/	6,675 7/	5,556	7,390	6,421	162,265
DEPT. PARKS & REC., L.A. CO. REC. DEPT.	5,777	2,119	3,098	3,977	3,386	3,285	21,642
PIRU CREEK FISH ENHANCEMENT	2,915	0	0	0	0	0	2,915
CASTAIC LAKE W.A.	6,978	9,516	9,476	11,477	12,401	13,928	63,776
PALMDALE W.D.	0	0	0	0	1,558	3,096	4,654
UNITED WATER C.D. 1/	0	0	0	0	0	998	998
TOTALS	~~42,873,548~~ 42,054,148	4,120,036	3,176,779	4,420,534 4,416,600	4,719,352	4,274,006	~~63,584,255~~ 62,799,221

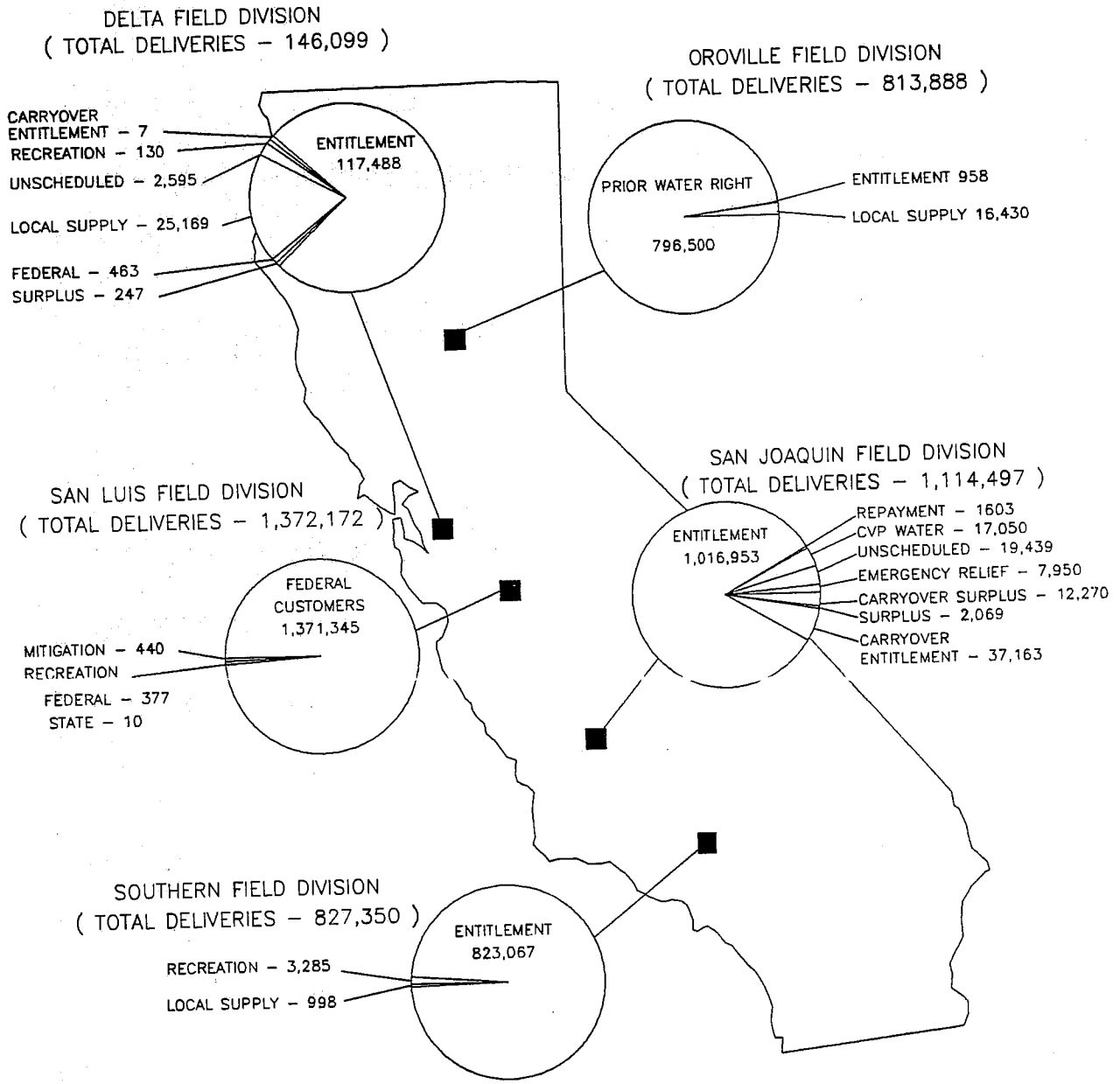
1/ Includes regulated delivery of local supply.
2/ Prior water right entitlement.
3/ Conveyance of C.V.P. water as of 1981.
4/ Hacienda Water District was annexed by Tulare Lake Basin W.S.D. in 1981.
5/ Includes Green Valley W.D. (Federal).
6/ Repayment of preconsolidation water.
7/ Includes 681 acre-feet delivered and stored at state expense, charge to be made upon withdrawal.
8/ Ground water withdrawn as an entitlement delivery.
9/ Includes 1,650 acre-feet of ground water withdrawn as entitlement and 5,728 acre-feet stored at state expense.
10/ Includes 199 acre-feet delivered to Pleasant Valley W.D. in San Luis Field Division.
11/ Includes 559 acre-feet of 1982 Exchange water stored in Lake Oroville and 126 acre-feet stored in a MWDSC ground water basin.
12/ Billed for 126 acre-feet of 1982 Exchange Water, but not included here. Includes 3,111 acre-feet of local-out through reach 30.
13/ Includes 4,300 acre-feet of C.V.P. exchange water.
14/ Includes 45,584 acre-feet of Local-Out.
15/ Include 1,703 acre-feet transferred to Tulare Lake Basin W.S.D.
16/ Includes 6,500 acre-feet to K.C.W.D., 6,500 to Lakeside I.W.D., and 50 to Green Valley W.D.

FIGURE C: TOTAL PROJECT DELIVERIES

ANNUAL TOTALS



MAP 3
PROJECT WATER DELIVERIES
1986
(in acre-feet)



Total Project Deliveries
4,274,006

ENERGY OPERATIONS

ENERGY SOURCES

Energy generation from the SWP's seven hydroelectric plants (Hyatt, Thermalito, Gianelli, Alamo, William E. Warne, Castaic, and Devil Canyon) during 1986, grossed about 3,708,500 megawatthours (MWh), as illustrated in Figure D on Page 19. This is a 15 percent increase over generation in 1985, and was sufficient to meet about 72 percent of SWP energy requirements in 1986. Monthly generation totals for each plant are shown in Table 2 on Page 20, and described below.

Edward Hyatt and Thermalito Powerplants supplied 2,450,520 MWh in 1986, a 44 percent increase over the amount generated in 1985, and above the average annual output of about 2,380,000 MWh for these plants. Operation of Edward Hyatt and Thermalito Powerplants is shown in Figure E on Page 21.

The combined energy generation at the SWP energy recovery plants (~~San Luis~~ Gianelli, Alamo, William E. Warne, Castaic, and Devil Canyon) totaled 1,257,826 MWh in 1986. This is about 83 percent of the amount generated in 1985, and reflects the decrease in the amounts of water conveyed through the California Aqueduct.

The Bottle Rock Powerplant, a 55-MW geothermal plant, supplied the SWP with a total of 180,633 MWh in 1986, a 13 percent decrease from the 1985 amount. DWR paid MCR Geothermal Corp. $4,275,343 but withheld $1,253,840 because insufficient steam supply prevented Bottle Rock Powerplant from generating at full capacity.

Reid Gardner Unit No. 4 supplied 798,856 MWh. This amount included the return to DWR of 15,600 MWh that was banked with Nevada Power Company during start-up of the unit in 1983. The balance of banked energy due to DWR was about 14,400 MWh as of December 31, 1986. The total generation was only 43 percent of the amount generated in 1985. The plant was closed for several weeks for maintenance, minor repairs, and removing core samples from the cooling tower. Because of the high availability and lower cost of hydro generated power, Reid Gardner was operated at a minimum level of about 80 MW.

Under a 50-year contract with the Kings River Conservation District, DWR receives all the output of the 165-MW Pine Flat Powerplant. The plant furnished 835,763 MWh to the SWP in 1986, more than twice the amount furnished in 1985.

DWR has a contract with TERA Corporation for purchase of the energy from two hundred 50-KW wind turbines constructed at Bethany Wind Park near the South Bay Pumping Plant. ~~One hundred and~~ only

forty five wind turbines were operational at the end of 1986, delivering 4,143 MWh to the SWP during the year, only 33 percent of the amount delivered in 1985.

SWP energy generation as a part of all SWP energy resources in 1986 is illustrated in Figure F on Page 22.

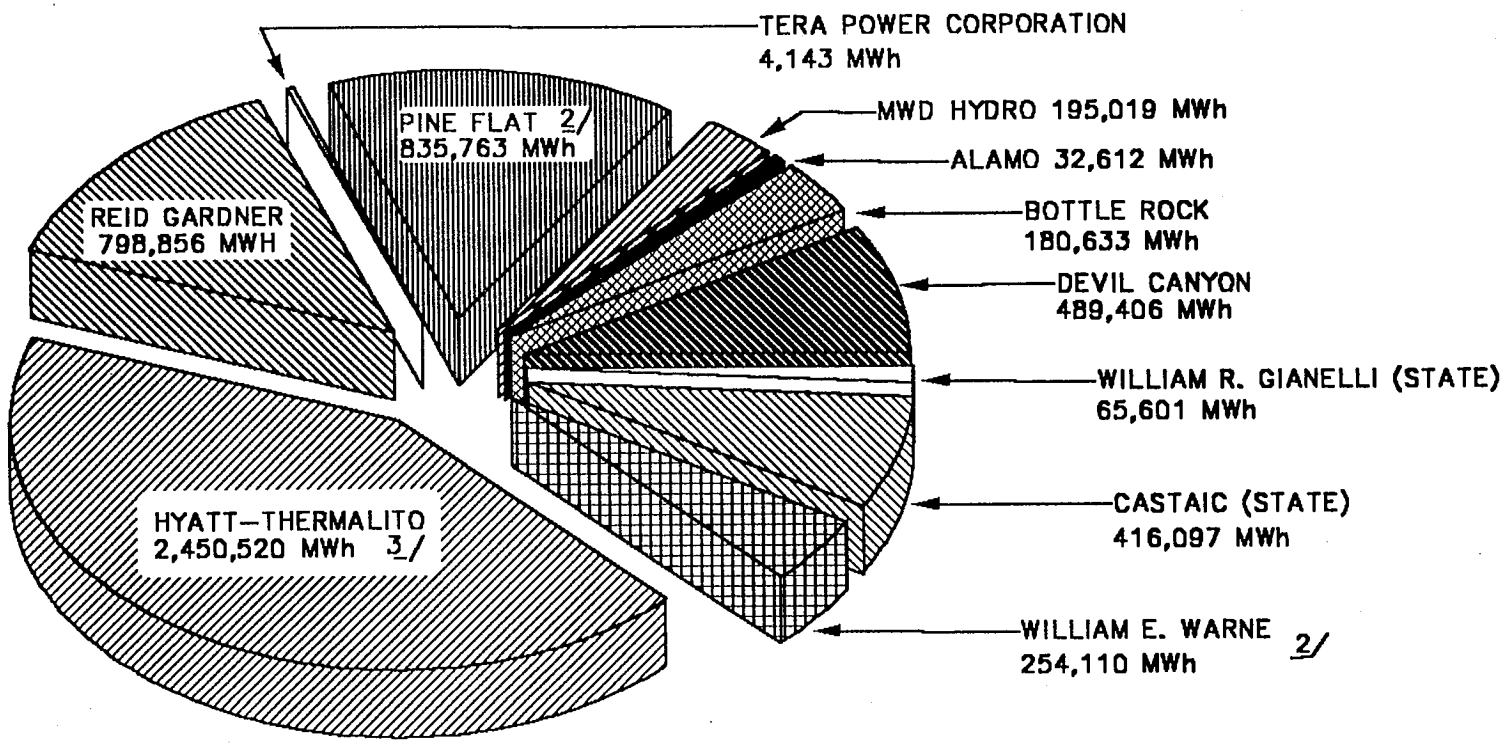
The SWP receives energy under contract from five small hydroelectric facilities (total capacity of 30 MW) owned and operated by The Metropolitan Water District of Southern California. In 1986, these plants furnished 191,424 MWh of energy to the SWP. DWR has exchange arrangements with Southern California Edison (SCE) and the Los Angeles Department of Water and Power (LADWP) to provide transmission of this energy.

The DWR-SCE Power Contract has been in effect since April 1983. Under this contract, part of the Hyatt-Thermalito Powerplants' generation and all the output of Devil Canyon and Alamo Powerplants are delivered to SCE. Energy delivered during on-peak periods is returned off-peak along with additional off-peak energy as compensation for the on-peak capacity. The net gain to the SWP during 1986 was 1,570,999 MWh, only 2,395 MWh less than the 1985 amounts.

DWR purchased about 1,275,317 MWh from various utilities during 1986. Most of the energy purchased came from the Pacific Northwest via DWR's contracted 300 MW of transmission capacity in the extra high voltage Pacific Northwest Intertie.

SWP energy sources are shown in Figure D on Page 19, and also in Table 2 on Page 20.

FIGURE D: SWP ENERGY SOURCES 1/
1986



TOTAL: 5,722,760 MWh

Note: Purchases, Other Sources, and SCE Return Additional are not shown here.

1/ Values are metered readings at plants and are not adjusted for transmission losses.

2/ Includes station–service energy.

3/ Includes Table Mtn. out, Hyatt out adjusted to Tesla, and a pump credit of 87,441 MWh from SCE.

TABLE 2: PROJECT POWER RESOURCES
1986

(in megawatthours)

RESOURCE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
Hyatt-Thermalito Powerplant 1/	44,328	303,708	536,715	148,440	169,866	167,344	313,108	223,154	201,884	154,054	99,610	88,309	2,450,520
Bottle Rock	24,730	16,134	12,561	0	0	4,027	23,827	24,810	24,936	26,574	11,165	11,869	180,633
William R. Gianelli Generation													
State	0	0	-65	87	7,646	9,917	34,434	13,552	30	0	0	0	65,601
Federal	0	0	12,093	15,288	9,452	62,258	40,883	20,651	620	0	0	0	161,245
Total	0	0	12,028	15,375	17,098	72,175	75,317	34,203	650	0	0	0	226,846
William E. Warne Powerplant 2/	27,111	18,269	882	14,659	16,990	9,152	16,597	30,615	35,580	19,953	27,895	36,407	254,110
Castaic Powerplant State	48,360	32,640	72	25,780	25,680	14,928	28,536	47,304	56,256	26,837	48,816	60,888	416,097
Alamo Powerplant	0	0	0	0	0	232	6,223	6,315	6,830	5,022	5,945	2,045	32,612
Devil Canyon Powerplant	26,555	26,776	10,033	17,960	61,040	52,478	54,847	51,595	62,578	54,514	48,649	22,381	489,406
Tera Corp.	0	0	355	747	801	670	424	497	347	219	79	4	4,143
MWD Hydro	12,500	8,830	8,542	12,414	21,535	20,755	22,025	20,464	19,919	18,956	18,489	10,560	195,019
Reid Gardner Powerplant	173,594	15,772	0	54,076	54,515	88,555	89,244	83,268	80,248	56,730	35,178	67,676	798,856
Pine Flat	0	8,053	112,357	130,362	137,173	146,337	142,311	100,716	35,387	23,067	0	0	835,763
Purchases 3/	138,989	38,672	38,177	24,805	119,392	85,032	63,660	184,487	101,411	167,272	187,356	126,064	1,275,317
Other Sources 4/	4,004	5,731	4,203	34,532	17,807	12,787	33,106	37,384	24,125	2,802	8,460	6,433	191,424
SCE Return Additional	164,549	118,324	38,091	114,792	64,267	71,201	41,093	121,195	174,011	210,871	232,825	219,780	1,570,999

1/ Includes Table Mountain out, Hyatt out adjusted to Tesla, and 87,441 MWh of pump credit from SCE.

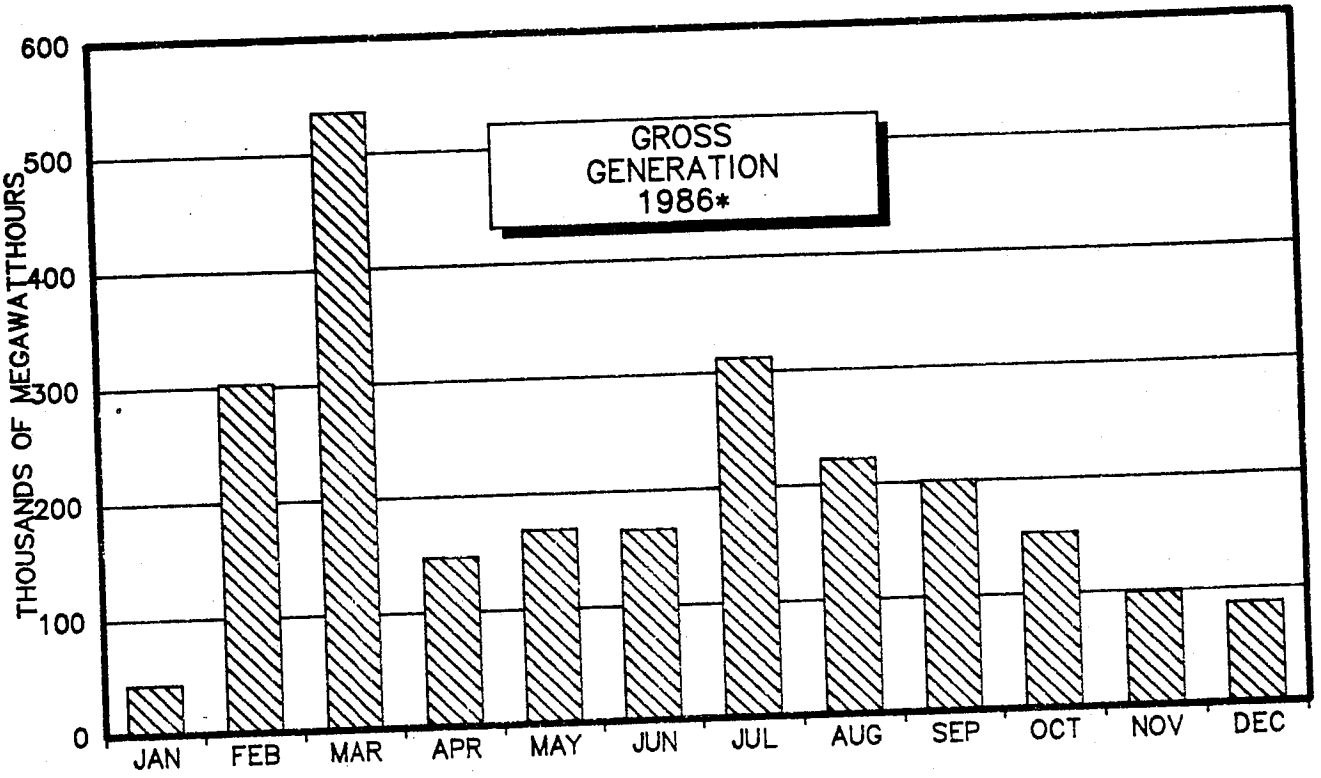
2/ Includes station-service energy.

3/ Includes Bonneville Power Authority, Portland General Electric, Pacific Power & Light Co., Salt River Project (non-firm purchase), Montana Power Co., Seattle City Light, British Columbia Hydro Power Authority, Idaho Power Co., Washington Water and Power Co.

4/ Includes Salt River Project (return energy), Pacific Gas & Electric, Southern California Edison, Western Area Mid-Pacific, and Los Angeles Department of Water and Power.

State:	8,760,500
Federal:	161,245
Total Project	8,921,745

FIGURE E: OPERATION OF EDWARD HYATT AND THERMALITO POWERPLANTS



* Includes station-service and pump-back energy.

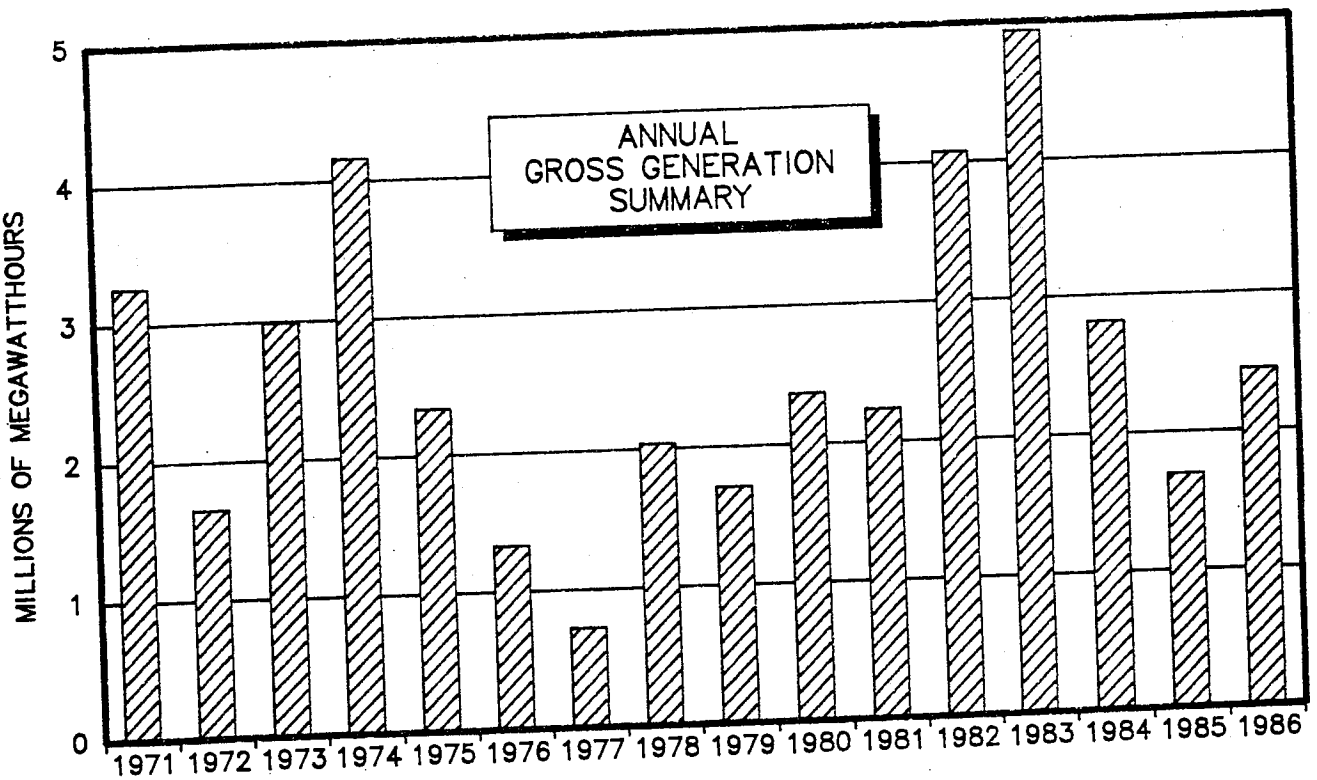
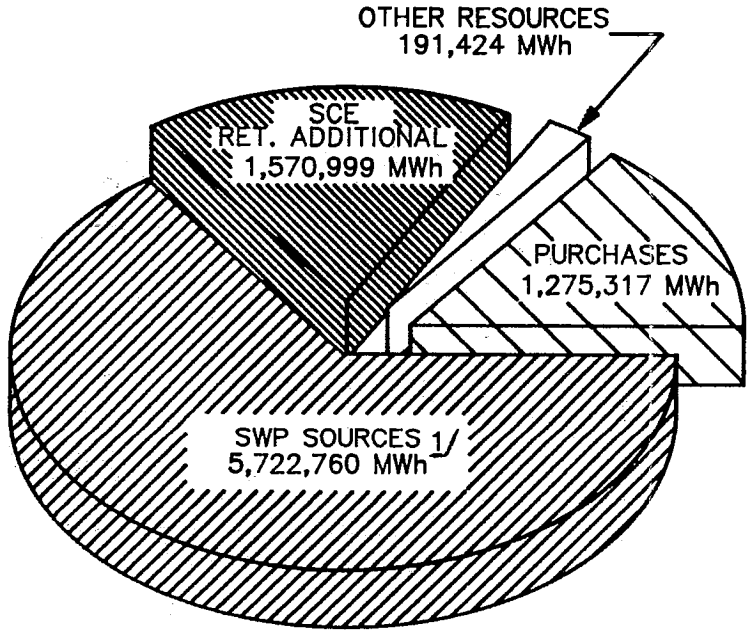


FIGURE F: ENERGY RESOURCES
(STATE ONLY)
1986



TOTAL: 8,760,500 MWh

PURCHASES

1. Bonneville Power Authority	757,250 MWh
2. Pacific Power and Light Company	216,070 MWh
3. Portland General Electric Company	156,615 MWh
4. Salt River Project	58,843 MWh
5. Idaho Power Company	38,449 MWh
6. British Columbia Hydro Power Authority	27,573 MWh
7. Montana Power Company	20,309 MWh
8. Washington Water and Power	208 MWh
	1,275,317 MWh

OTHER RESOURCES

1. Southern California Edison	161,586 MWh
2. Pacific Gas and Electric	23,232 MWh
3. Los Angeles Dept. of Water and Power	4,728 MWh
4. Western Area Mid-Pacific	1,848 MWh
5. Salt River Project 2/	30 MWh
	191,424 MWh

SCE RETURN ADDITIONAL

1. Total received from SCE	3,310,830 MWh
2. SCE Hyatt-Thermalito Entitlement	-847,912 MWh
3. SCE Devil Canyon Entitlement	-489,406 MWh
4. SCE Alamo Entitlement	-32,612 MWh
5. MWD Hydro Entitlement	-195,019 MWh
	1,570,999 MWh

1/ See Figure D for a breakdown of this source.
2/ For transmission losses during February only at ELDORADO.

ENERGY LOADS

Total energy used by the SWP during 1986 was 5,000,778 MWh, not including 166,120 MWh of system losses. This amount was 94 percent of the amount used in 1985. This decreased energy use reflected decreased water deliveries to SWP contractors by about 13 percent from 1985. SWP energy use was nearly evenly distributed between the Pacific Gas & Electric Company service area and the SCE service area. SWP energy loads are shown by field division in Figure G on Page 24, and also are listed in Table 3 on Page 25.

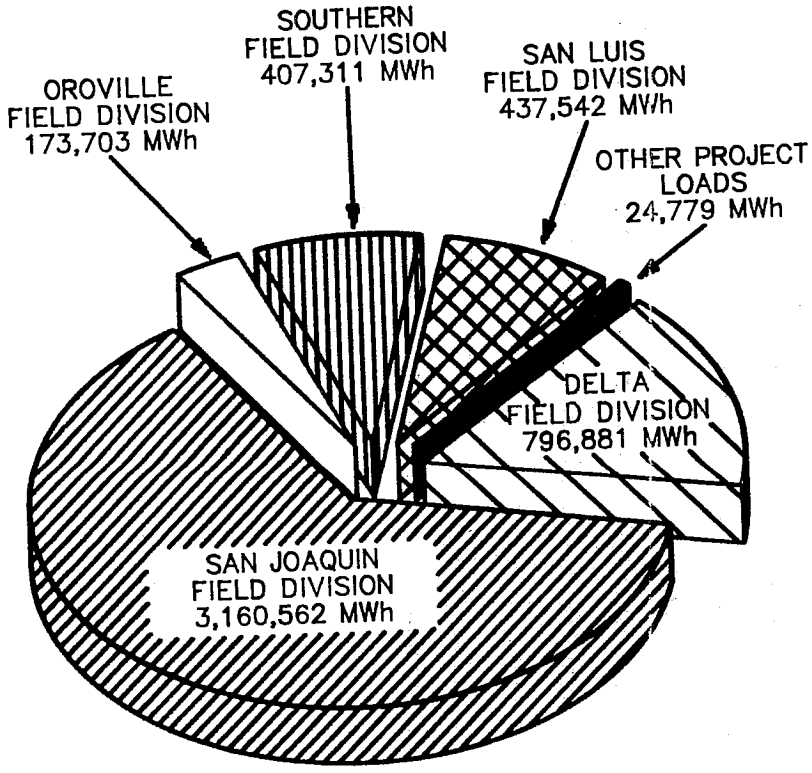
During 1986, SWP energy supplies (including substantial purchases under contractual obligations) exceeded SWP needs, and DWR sold the excess energy under power sale contracts to 15 utilities at current market rates. The total sale of energy during 1986 was about 3,480,000 MWh for a revenue of $68.37 million. Other Power related revenues were peaking-capacity payments from Nevada Power Company and peaking-capacity foregone payments from LADWP for a combined revenue of $1.92 million.

The decision to sell the power, or to wait for a more opportune time, is based on projected SWP operations, anticipated changes in the power market, energy losses, transmission costs, and dispatching costs. The revenue from these energy sales during 1986 exceeded expenditures for purchases and transmission services. This reflects only the cash transactions during 1986, and is not indicative of the true net cost of SWP energy, which includes such other costs as:

* debt service and operation, maintenance, and replacement (OM&R) costs associated with SWP-owned hydroelectric facilities.
* debt service and OM&R costs associated with the output of Pine Flat Powerplant.
* debt service, OM&R, and fuel costs associated with Reid Gardner Unit No. 4 and other SWP-owned generation facilities.

The total energy load in 1986 is illustrated in Figure H on Page 26. Table 20 in Appendix II presents corresponding totals of monthly water pumped through the SWP.

FIGURE G: PROJECT ENERGY LOADS BY FIELD DIVISION
1986



TOTAL: 5,000,778 MWh

Note: See Figure H for other energy loads.

OROVILLE FIELD DIVISION

1. Hyatt–Thermalito Complex (Pump–back and Station Service)	173,703	MWh

DELTA FIELD DIVISION

1. North Bay	1,761	MWh
2. South Bay	97,905	MWh
3. Del Valle	72	MWh
4. Harvey O. Banks Delta	696,131	MWh
5. Bottle Rock (Station Service)	1,012	MWh

SAN LUIS FIELD DIVISION

1. William R. Gianelli	165,733	MWh
2. Dos Amigos	271,265	MWh
3. Pine Flat (Station Service)	544	MWh

SAN JOAQUIN FIELD DIVISION

1. Las Perillas	10,398	MWh
2. Badger Hill	27,937	MWh
3. Buena Vista	262,889	MWh
4. Wheeler Ridge	268,497	MWh
5. Wind Gap	578,653	MWh
6. A.D. Edmonston	2,012,188	MWh

SOUTHERN FIELD DIVISION

1. Oso	118,290	MWh
2. Pearblossom	228,168	MWh
3. William E. Warne (Station Service)	853	MWh

OTHER PROJECT LOADS

1. Exchange Energy	13,767	MWh
2. Reid Gardner Unit No. 4	8,693	MWh
3. SBVMWD (General Replacement Energy)	2,076	MWh
4. South Bay Pumping Plant	178	MWh
5. Net Exchange Energy at Gianelli	65	MWh

TABLE 3: PROJECT POWER USES
1986

(in megawatthours)

SOURCE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
Hyatt-Thermalito Pumpback and Station Service	617	1,168	34	31,628	45,197	12,084	21,177	27,832	15,455	4,874	6,757	6,880	173,703
North Bay	314	197	90	89	130	201	207	188	129	83	52	81	1,761
South Bay	6,241	5,317	2,975	7,439	9,960	11,844	14,349	14,011	8,128	4,889	4,158	8,594	97,905
Del Valle	6	6	6	5	5	5	6	5	6	5	7	8	72
Banks													
State	87,154	33,773	13,677	35,935	55,194	53,374	50,244	82,783	110,886	61,869	54,415	56,827	696,131
Federal	4,430	0	0	0	0	0	21,217	0	0	0	0	0	25,647
Bottlerock 1/	24	0	121	107	111	177	53	130	96	17	53	123	1,012
Gianelli													
State	63,115	2,486	767	1,585	6,001	244	244	6,147	55,171	25,465	485	4,023	165,733
Federal	43,291	43,285	40,530	28,328	2,350	0	0	0	24,407	28,566	47,748	67,454	325,959
Dos Amigos													
State	16,206	13,918	7,424	14,209	25,564	27,210	39,031	38,601	25,712	17,379	23,616	22,395	271,265
Federal	15,536	14,501	11,147	14,482	17,445	32,934	34,232	24,684	4,554	5,139	4,382	8,403	187,439
Pine Flat 1/	63	159	0	1	0	0	0	0	0	7	90	224	544
Las Perillas	517	384	602	1,075	1,467	1,814	1,942	1,274	697	405	70	151	10,398
Badger Hill	1,365	1,003	1,600	2,895	4,070	4,944	5,159	3,475	1,862	1,052	150	362	27,937
Buena Vista	18,948	14,179	8,883	12,291	27,627	24,087	28,444	31,693	30,891	19,794	24,702	21,350	262,889
Wheeler Ridge	20,933	14,667	5,819	11,594	28,899	21,305	25,986	30,006	34,406	22,211	28,254	24,417	268,497
Wind Gap	46,576	32,151	11,433	23,301	61,218	42,918	54,073	65,570	76,263	48,935	62,652	53,563	578,653
A.D. Edmonston	163,444	113,002	37,135	79,784	213,316	145,661	184,033	266,847	226,892	171,368	222,295	188,411	2,012,188
Oso	12,854	8,662	1,104	6,577	8,265	3,929	7,890	13,213	16,104	9,137	13,235	17,320	118,290
Pearblossom	16,969	12,524	8,099	5,208	40,503	30,819	32,014	31,507	37,506	27,334	32,713	12,972	288,168
Wm. E. Warne 1/	22	65	120	96	110	100	89	16	5	126	68	36	853
Other Project Loads 2/	148	15,420	1,245	360	941	4,036	218	247	227	264	1,387	286	24,779

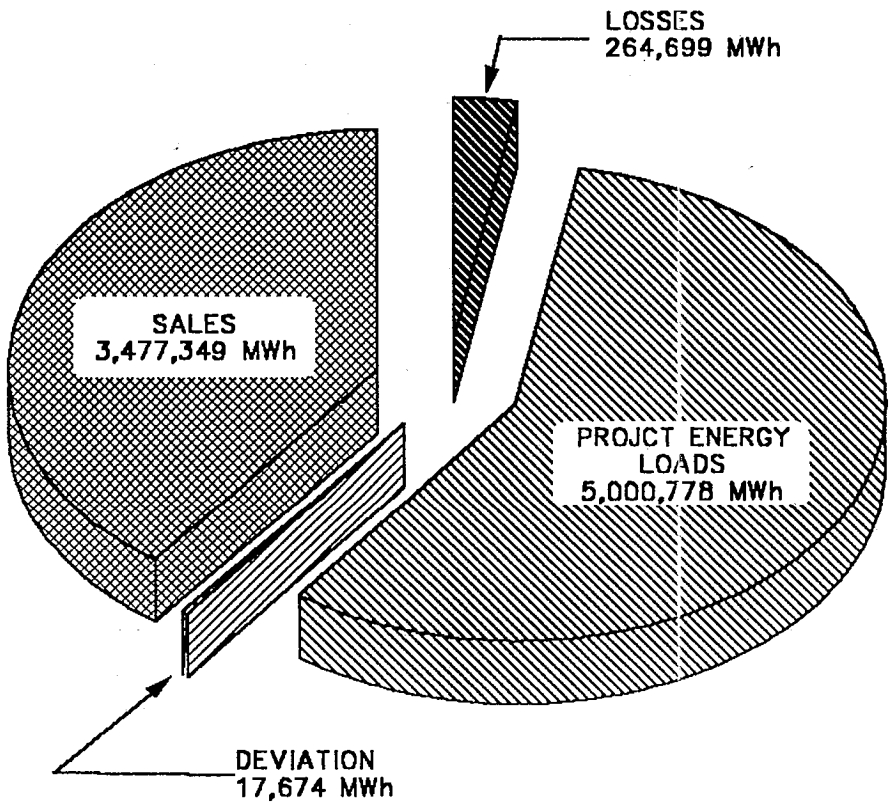
Total State:	5,000,778
Total Federal:	539,045
Total Project:	5,539,843

1/ Station Service only.

2/ Includes Nevada Power Company and Project Emergency Service, deviation adustment for Pacific Gas and Electric.

FIGURE H: TOTAL ENERGY LOAD

1986



SALES	
1. Pacific Gas and Electric Company	1,113,280 MWh
2. Southern California Edison	774,618 MWh
3. City of Vernon	432,874 MWh
4. Nevada Power Company	363,323 MWh
5. City of Anaheim	183,148 MWh
6. City of Santa Clara	124,400 MWh
7. San Diego Gas and Electric	121,250 MWh
8. Salt River Project	65,788 MWh
9. City of Riverside	65,584 MWh
10. City of Pasadena	64,335 MWh
11. City of Burbank	61,183 MWh
12. Los Angeles Dept. of Water and Power	48,225 MWh
13. City of Glendale	32,232 MWh
14. Northern California Power Agency	26,909 MWh
15. El Paso Electric	200 MWh

TOTAL: 8,760,500 MWh

Note: See Figure G for breakdown of Project Energy Loads.

SACRAMENTO-SAN JOAQUIN DELTA OPERATIONS

The SWP operations in the Sacramento-San Joaquin Delta are greatly influenced by the classification of year type as prescribed by the SWRCB's D-1485 (see Page 8). Forecasts of the Sacramento River Index classified the 1985-86 water year as a "wet" year. In addition, the May 1 forecast designated the water year as a "subnormal snowmelt," substantially relaxing the Delta Outflow Index (DOI) requirements in May, June and July under D-1485. Water quality conditions were good throughout 1986, and all D-1485 standards were met by comfortable margins.

The DOI is a calculated value that is a relative measure of the net westerly flow of fresh water at Chipps Island near Pittsburgh. Total Delta outflow, which is the DOI, plus flows through the Yolo Bypass via the Fremont and Sacramento Weirs, averaged about 171,000 cfs in February (mean daily flow/month), peaking at nearly 500,000 cfs on February 20. The total Delta outflow declined to an average of about 149,000 cfs in March, then declined sharply through the spring to approximately 13,400 cfs in May. Flows decreased further throughout the summer to a low of approximately 5,000 cfs in August. During the Fall of 1986, an unusually dry season, the DOI was maintained moderately high overall to support Delta water quality, but never exceeded 12,000 cfs. Throughout the year, however, both the DOI and the Sacramento River flow at Rio Vista remained above the minimum flows required by D-1485 standards.

The May through July Delta export limits of D-1485 were also met by small margins in May and June as discussed later in this section.

Figure I on Page 29 shows 1986 water quality data compared to their respective standards at three Delta stations: Emmaton, Jersey Point, and Contra Costa Canal Intake. Figure J on Page 30 shows 1986 high-high tide at Antioch, the DOI, and Delta inflow.

"Balanced water conditions" [5/] in the Sacramento-San Joaquin Delta were declared by the DWR and the USBR from June 21 through August 5. Flows in the Delta were controlled by coordinating releases from upstream reservoirs of the two agencies. The determination for apportioning each agency's share of responsibility for reservoir releases was based on the draft "Supplemental Agreement between the United States of America and the State of California for Coordinated Operation of the Central Valley Project and the State Water Project," dated May 13, 1971. Both agencies operated by letter of agreement dated May 22, 1986, as if the draft coordinated agreement was in effect, with exceptions for specific modifications. The final agreement was finally signed on November 24, 1986. Figures K-1, K-2, and K-3 on pages 33, 34 and 35 show CVP-SWP coordinated operations for 1986. These figures show "lagged storage withdrawals." This term means that the storage withdrawals had been adjusted for the travel time, or "lag," (to the nearest whole day) for reservoir releases to reach the Delta, and water data at the Delta will then be

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5 "Balanced water conditions" occur when it is agreed by USBR and DWR that the releases of water from upstream CVP and SWP reservoirs, plus other inflows, approximately equal the water supply needed to meet Sacramento Valley in-basin uses, including water quality objectives, plus exports.

on the same time basis. For data comparisons and calculations at the Delta, storage withdrawals from Whiskeytown and Shasta Lakes are time lagged by five days, those from Lake Oroville are lagged by three days, and those from Folsom Lake are lagged by one day. During the time when balanced water conditions were in effect, the State provided its share of storage releases to meet the in-basin use and D-1485 water quality requirements of the 1986 Federal-State interim coordinated operation agreement.

Table 4 on Page 34 tabulates by months the routing of water released to the Sacramento, Feather, and American Rivers from CVP-SWP upstream reservoirs. The DOI represents water flowing to the ocean which provides a fresh water barrier to the more-saline water from the west, and thus maintains desired levels of Delta water quality. During the period of balanced water conditions, any water more than that needed for in-basin use (including Delta consumptive use and the DOI) is available for export from the Delta by the terms of D-1485.

To protect the striped bass fishery and avoid pumping very small fish from the Delta, D-1485 limits exports from the Delta to 3,000 cfs average monthly flow for both the CVP and the SWP during May and June, plus a limit of 4,600 cfs average monthly flow for each Project in July. In 1986, these limits were met with small margins in May and June by the SWP. Total exports (state and federal) for the year from the Delta by SWP facilities were about 2.47 million ac-ft. For a detailed description of federal pumping at Banks Pumping Plant, see Page 47.

Operation of the SWP increases and reduces the mean DOI. The DOI was augmented by the operation of the SWP in March and July, and reduced during the remainder of the year. The monthly mean rate of reduction during the year was about 4,800 cfs, and the monthly mean rate of augmentation was about 1,500 cfs. The DOI remained well above the level required by D-1485 throughout 1986. Table 5 on Page 35 provides a tabulation of the daily computed total Delta outflow. It includes flows in the Sacramento River at Sacramento and in the San Joaquin River at Vernalis, plus Yolo Bypass flows from Fremont Weir and from Sacramento Weir. Starting on July 1, 1982, the flow measurements in the Sacramento River at Sacramento were shifted from the "I" Street Bridge to a more accurate measurement at Freeport.

During lower flow years, a rock barrier is installed across Old River at its confluence with the San Joaquin River to encourage the upstream migration of salmon and steelhead by increasing fall flows in the lower San Joaquin River. The barrier was not requested by the Department of Fish and Game in 1986, and therefore was not installed by DWR.

For further information and data on 1986 Delta operations, see DWR Bulletin 132-87, "The California State Water Project, Appendix E, Water Operations in the Sacramento-San Joaquin Delta During 1986."

FIGURE I: WATER QUALITY CONDITIONS AT SELECTED DELTA STATIONS 1986

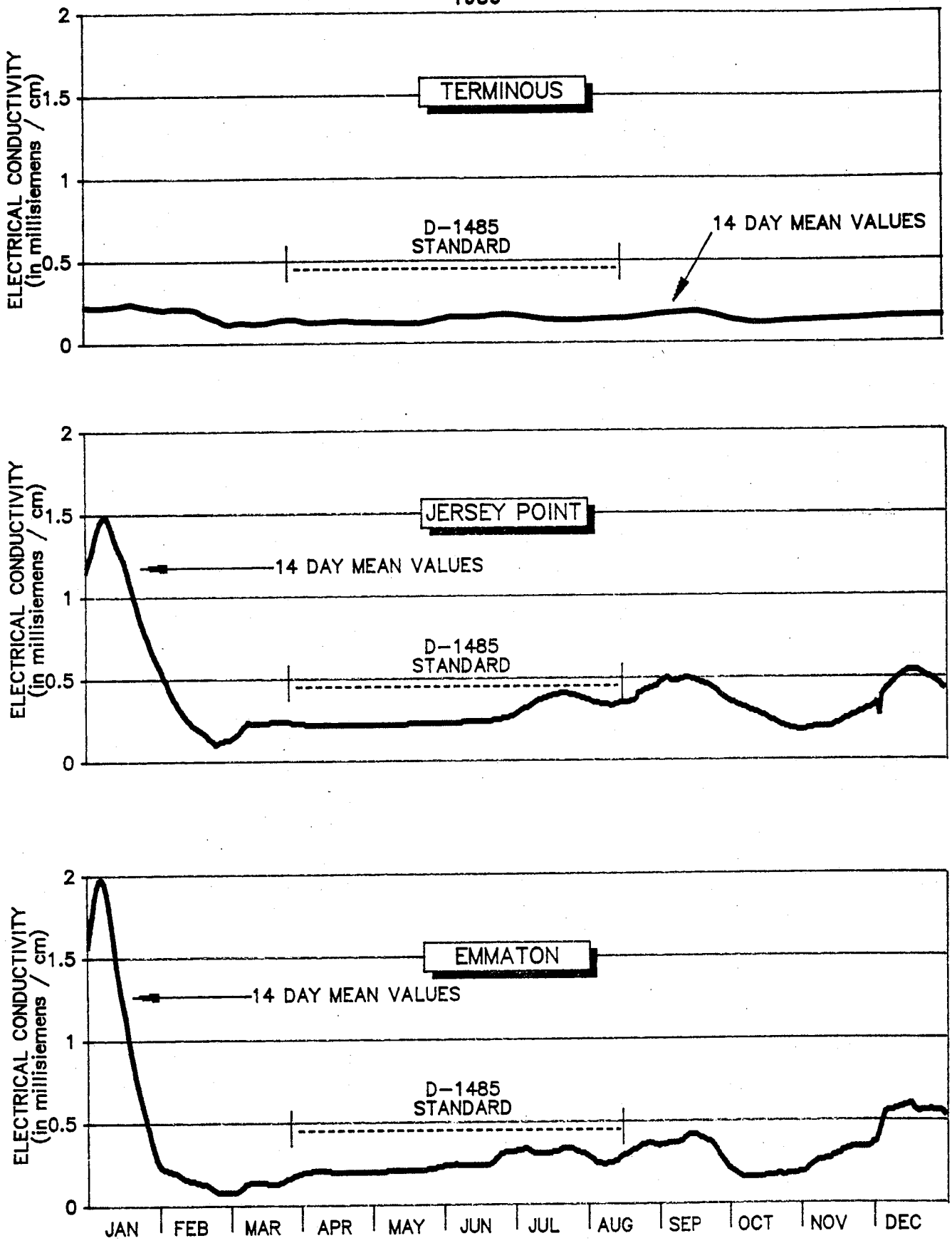


FIGURE J: DELTA TIDE, INFLOW, AND OUTFLOW
1989

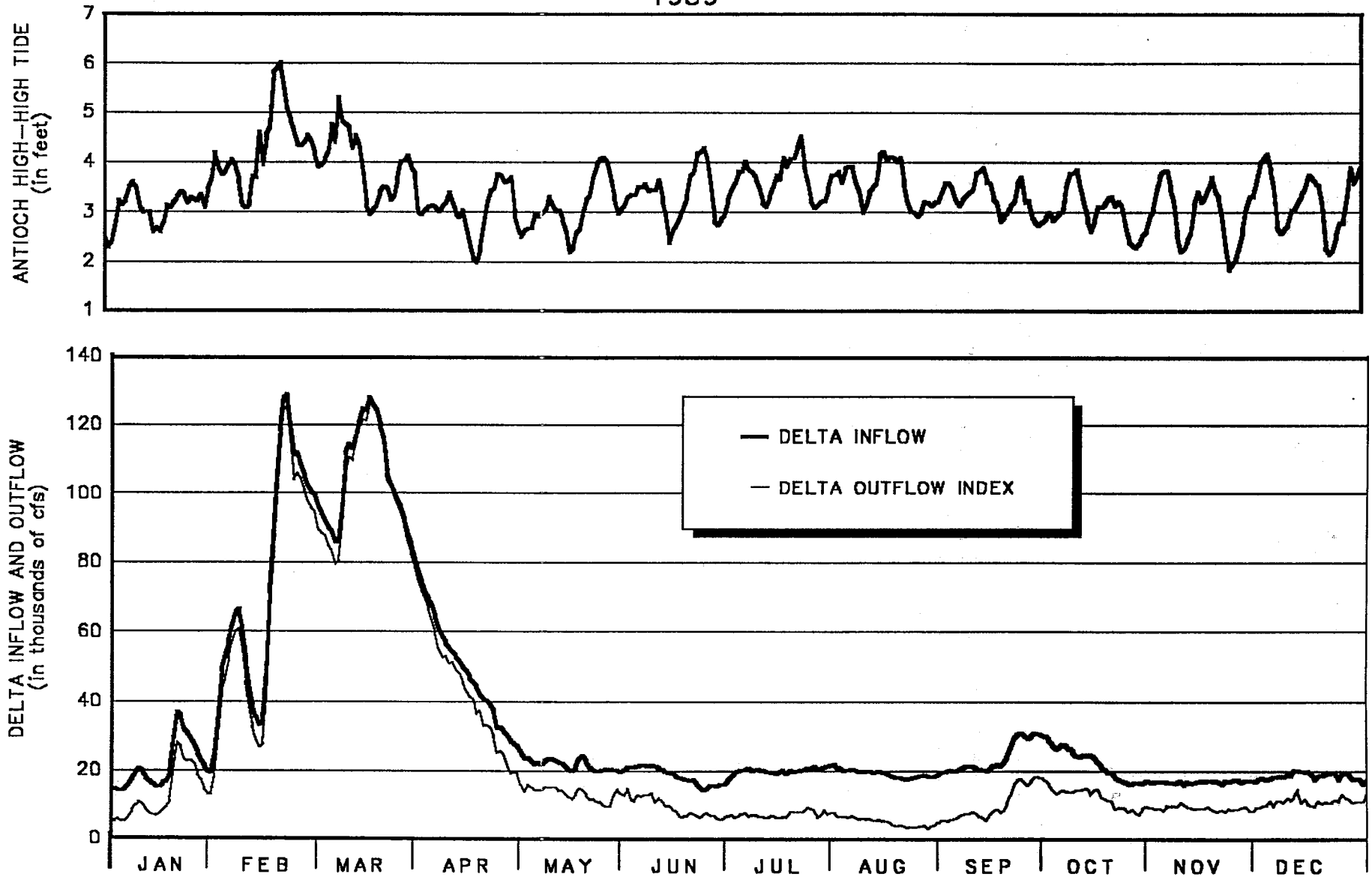
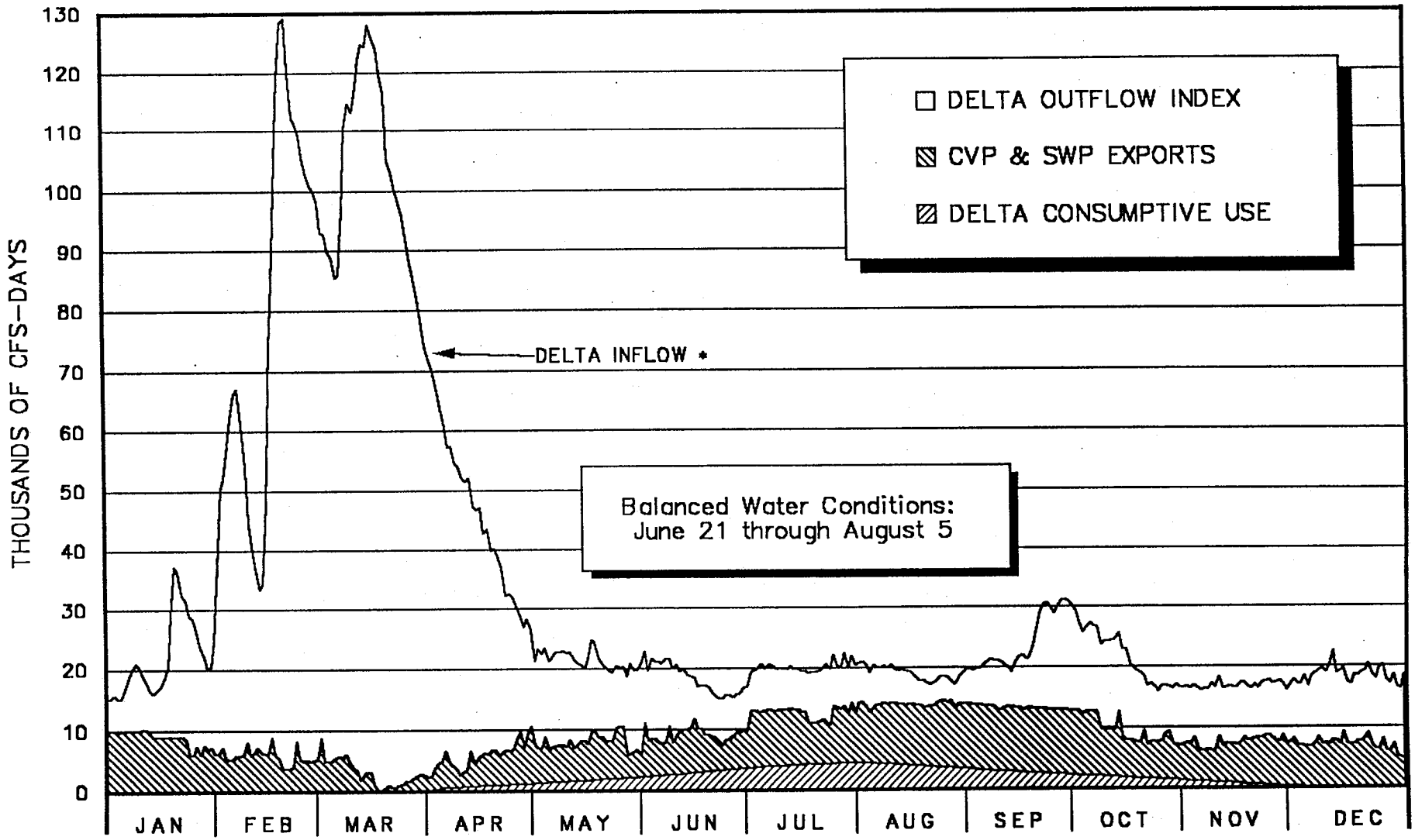


FIGURE K-1: COORDINATED DELTA OPERATIONS
1986



* Delta Inflow = Exports + Outflow + Consumptive use.

FIGURE K-2: COORDINATED DELTA OPERATIONS
LAGGED STORAGE WITHDRAWALS
1986

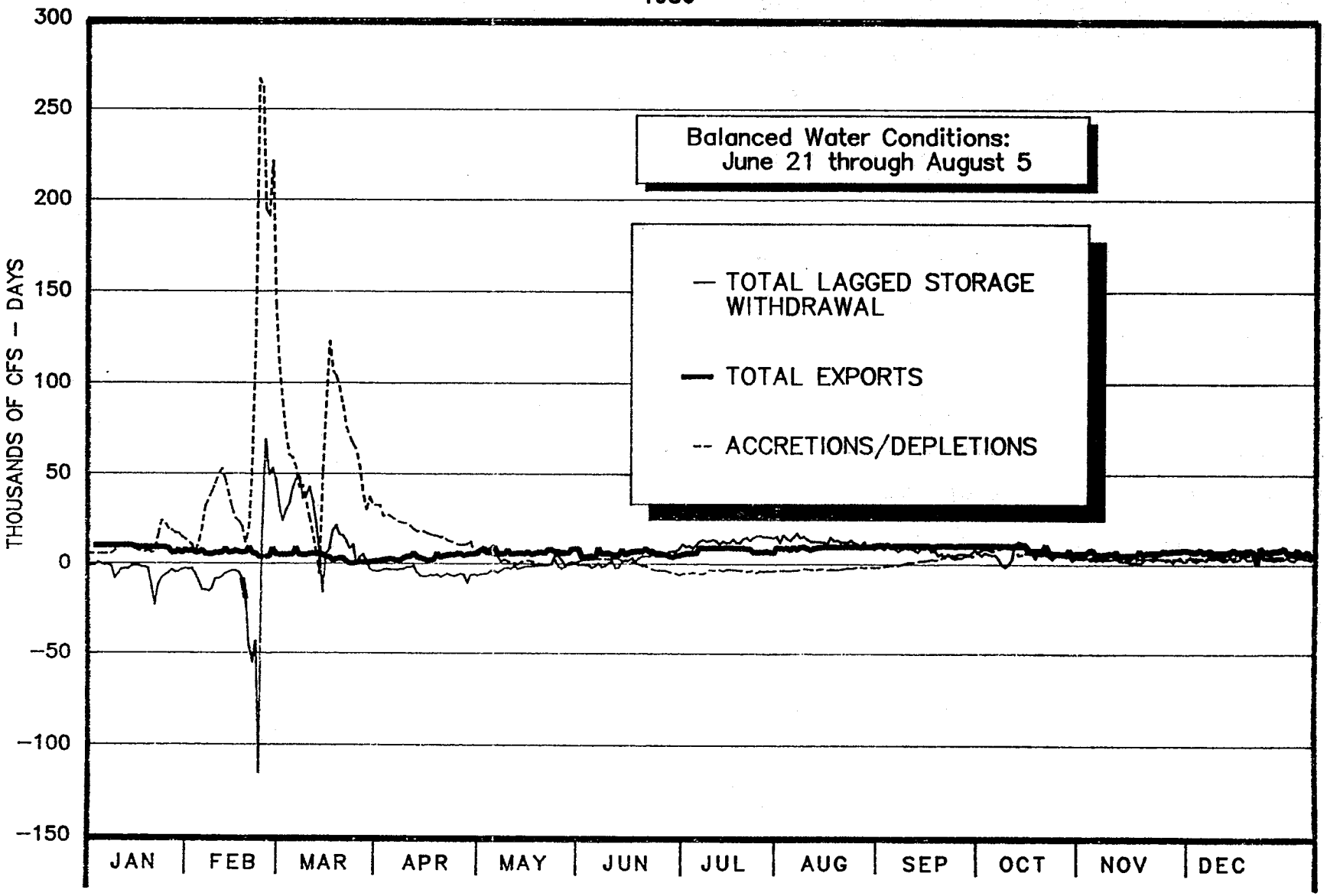
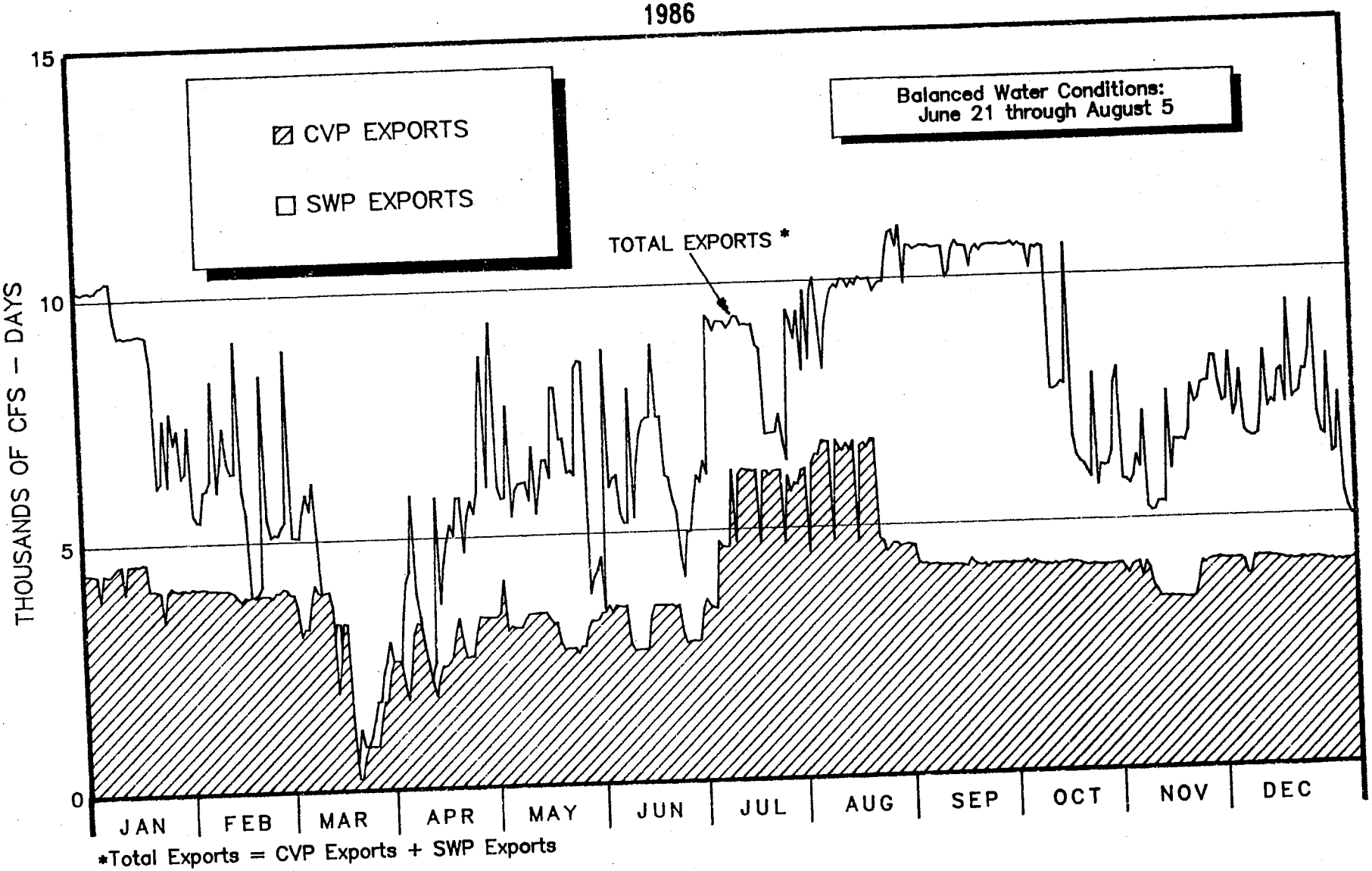


FIGURE K-3: COORDINATED DELTA OPERATIONS
DELTA EXPORTS
1986



*Total Exports = CVP Exports + SWP Exports

TABLE 4: SACRAMENTO BASIN AND SACRAMENTO-SAN JOAQUIN DELTA OPERATIONS
1986

(in thousands of acre-feet except as noted)

MONTH	UPSTREAM RESERVOIRS RELEASES TO RIVER			SACRAMENTO RIVER IN-BASIN SUPPLY	DELTA INFLOW			DELTA USES			DELTA EXPORTS		
	KESWICK 1/	OROVILLE 1/	NIMBUS	2/	SACRAMENTO RIVER AT SACRAMENTO 3/	SAN JOAQUIN RIVER AT VERNALIS 4/	TOTAL 5/	DELTA CONSUMPTIVE USE	DELTA OUTFLOW INDEX TOTAL	DELTA OUTFLOW INDEX AVERAGE CFS	TOTAL EXPORTS	EXPORTED BY DWR	EXPORTED BY USBR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
JAN	249	105	164	681	1,227	99	1,298	-56	796	401	554	290	264
FEB	1,136	1,579	1,740	4,662	3,826	482	4,231	-37	3,931	1,982	335	112	223
MAR	2,225	1,638	912	3,073	4,610	1,647	6,338	-10	6,152	3,101	98	45	153
APR	273	264	337	798	1,535	1,170	2,791	63	2,449	1,235	90	120	171
MAY	512	75	141	65	784	537	1,331	121	825	416	80	184	195
JUN	548	87	168	-103	705	381	1,096	191	537	271	70	178	191
JUL	667	288	293	-203	1.038	205	1,252	268	456	229	28	168	359
AUG	625	219	201	-87	936	221	1,175	252	311	157	14	278	335
SEP	442	259	136	352	1,199	264	1,462	174	663	334	25	375	250
OCT	411	232	145	296	1,035	234	1,303	118	719	362	62	208	254
NOV	379	143	106	215	834	167	1,010	55	548	276	08	181	228
DEC	379	145	98	298	900	230	1,146	2	698	352	444	188	256
TOTAL	7,846	5,034	4,441	10,047	18,629	5,637	24,433	1,141	18,085	---	5,208	2,327	2,879

1/ Time lagged values (Keswick: 5 days; Oroville: 2 days).
2/ Positive values are accretions; negative values are depletions.
3/ These values are a measured daily average taken from the Sacramento River at Freeport.
4/ These values are based on daily 6 a.m. readings. Columns 1, 2, 3, 12, and 13 are based on measured total daily flow.
5/ Includes Sacramento County Regional Waste Treatment Plant.

TABLE 5: CALCULATED TOTAL DELTA OUTFLOW (INCLUDES YOLO BYPASS FLOWS)
1986
(in cfs-days except as noted)

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	5,199	30,807	178,669	71,832	13,873	11,794	6,352	6,596	5,557	14,451	9,087	9,943
2	5,237	43,006	162,232	69,200	16,217	11,309	6,589	6,704	5,919	13,481	8,480	9,983
3	5,724	46,724	155,045	66,583	15,320	12,976	7,347	6,498	6,074	14,032	9,970	11,443
4	5,243	52,266	135,949	62,700	14,482	12,496	7,734	6,921	6,649	14,567	9,803	9,764
5	5,122	56,886	122,744	59,617	14,429	13,178	6,757	6,379	7,147	14,127	10,072	11,309
6	6,588	60,166	108,975	55,029	14,524	13,075	7,404	5,946	7,546	13,909	9,749	11,300
7	8,261	60,980	93,651	52,724	15,285	13,716	7,236	6,072	7,592	13,976	10,863	10,828
8	9,863	55,154	90,608	53,238	15,208	11,050	6,676	6,035	8,202	14,524	10,222	12,141
9	10,778	45,648	155,907	50,900	15,301	12,034	6,795	6,252	7,650	14,475	9,567	11,554
10	10,190	38,494	209,187	51,361	15,273	11,455	6,523	5,572	6,860	14,669	9,484	12,691
11	8,547	32,978	236,268	49,052	14,310	9,696	6,640	5,549	6,456	14,900	9,022	14,508
12	7,616	29,184	234,733	48,100	14,449	9,917	6,951	5,693	5,579	13,165	9,175	10,952
13	6,974	26,862	238,208	45,374	13,160	8,707	6,493	5,541	7,383	14,459	9,130	11,977
14	6,854	28,096	234,091	42,889	12,415	8,530	6,545	5,316	8,405	14,775	9,175	10,381
15	7,562	41,479	218,598	41,293	11,787	6,851	6,616	4,995	9,006	12,428	9,743	10,057
16	8,273	93,771	216,790	41,101	13,386	6,682	6,572	4,199	8,037	11,996	8,943	9,660
17	9,323	222,640	207,188	36,490	14,978	6,824	8,047	3,971	8,383	11,561	8,479	11,215
18	11,167	425,416	193,278	37,345	14,483	7,877	8,122	4,267	10,505	11,485	8,265	10,609
19	19,877	477,515	179,844	33,052	13,103	7,679	8,175	3,892	12,879	8,996	8,678	11,190
20	28,068	499,794	156,863	33,300	11,804	7,122	8,175	3,375	16,055	9,547	8,014	10,989
21	27,234	476,174	138,475	32,786	12,037	6,584	8,313	3,708	17,351	9,353	8,989	11,096
22	23,399	421,113	117,712	30,294	11,271	7,156	9,506	3,777	17,591	8,958	8,632	11,761
23	22,957	347,638	108,736	25,355	11,080	7,582	9,079	3,814	16,569	8,077	8,881	11,314
24	22,977	297,070	103,012	25,870	10,017	7,096	8,487	4,039	15,823	8,858	8,963	13,133
25	22,144	258,131	98,331	24,869	9,639	7,046	6,574	4,137	17,263	7,693	9,420	12,138
26	18,997	223,386	94,050	21,388	9,717	6,129	7,109	3,083	18,209	7,156	9,631	11,637
27	17,456	200,963	90,475	19,141	12,735	6,007	8,737	3,913	18,152	9,163	8,507	10,854
28	14,641	187,191	85,835	19,614	14,547	6,317	7,423	4,145	18,018	9,758	8,511	11,272
29	13,181		82,853	18,909	13,311	6,777	7,779	4,916	17,278	9,368	9,407	11,220
30	13,197		78,881	16,011	12,945	7,137	7,677	5,747	16,293	9,262	9,359	11,118
31	18,537		74,539		14,967		6,730	5,748		9,067		13,641
TOTAL	401,186	4,779,532	4,601,727	1,235,417	416,053	270,799	229,163	156,800	334,431	362,236	276,221	351,678
AVE	12,941	170,698	148,443	41,181	13,421	9,027	7,392	5,058	11,148	11,685	9,207	11,344
MAX	28,068	499,794	238,208	71,832	16,217	13,716	9,506	6,921	18,209	14,900	10,863	14,508
MIN	5,122	26,862	74,539	16,011	9,639	6,007	6,352	3,083	5,557	7,156	8,014	9,660
TOTAL IN AF	795,752	9,480,202	9,127,526	2,450,450	825,241	537,130	454,545	311,013	663,344	718,495	547,884	697,553

Average for year = 36,754 cfs-days
Maximum for year = 499,794 cfs-days on February 20, 1986
Minimum for year = 3,083 cfs-days on August 26, 1986

Annual Total: 13,415,243 cfs-days
26,609,135 acre-feet

PROJECT OPERATIONS BY FIELD DIVISION

OROVILLE FIELD DIVISION

Water Storage

All upper Feather River reservoirs filled and spilled in 1986. Antelope Lake spilled continuously from February 18 through June 20. Antelope Lake has spilled every year since its original filling in 1965 except for 1977. Frenchman Lake spilled continuously from February 27 through May 19, and Lake Davis spilled from March 7 through 28 and again from May 6 through 18. Monthly operations for the three upper Feather River reservoirs are presented in Table 6 on Page 39.

During 1986, Lake Oroville encroached into the flood control reservation space twice, from February 15 through March 14 and from March 18 through April 8. Also, a total of 1,919,604 ac-ft spilled over Oroville Dam spillway during February and March. The computed inflow to Lake Oroville during 1986 was 6,138,282 ac-ft (including 283,421 ac-ft released from Ponderosa Dam, and 3,690 ac-ft released from Lake Wilenor). The maximum daily inflow into the lake was 397,759 ac-ft on February 17, and the maximum daily release to the Feather River from the Lake was 150,403 ac-ft on February 18. Detailed Information on Lake Oroville and the Oroville-Thermalito complex water operations is presented on Pages 40 through 45.

The following table presents the 1986 range of storages in the Oroville Field Division reservoirs:

Reservoir & Operational Capacity (ac-ft)		*Maximum (ac-ft)*	*Date*	*Minimum (ac-ft)*	*Date*
Antelope Lake	*22,566*	*25,530*	*3/08*	*14,132*	*01/04*
Frenchman Lake	*55,477*	*59,303*	*3/09*	*38,689*	*01/01*
Lake Davis	*84,371*	*88,480*	*3/10*	*65,593*	*01/03*
Lake Oroville	*3,537,577*	*3,326,353*	*6/15*	*2,096,125*	*01/03*

Water Deliveries

Deliveries during 1986 in the Oroville Field Division are shown in the following table:

Agency	Amount (ac-ft)
SWP Contractors:	
County of Butte	*308*
Plumas County	*254*
Yuba City	*62*
Local Supply (under special contracts):	
Last Chance Water District	*13,117*
Thermalito Irrigation District	*2,229*
Prior Water Rights Entitlement:	
Upper Feather Lakes	*2,041*
Palermo Canal	*7,970*
Thermalito Afterbay Deliveries:	
Sutter-Butte Canal	*449,647*
PGandE Lateral	*3,638*
Richvale Canal	*93,022*
Western Canal	*240,182*
Total	*813,888*

All the water delivered to SWP contractors in the Oroville Field Division was for municipal and industrial purposes. Table 1 on Page 14 presents water deliveries by year with totals to date for individual agencies.

Outages and Limitations

Major outages affecting operations in the Oroville Field Division in 1986 were:

* The intake electrical station service at the Edward Hyatt Powerplant was out of service from April 22 through 25. The intake gates and emergency closing were unavailable while repairing disconnect No. 413.
* The following power circuit breakers (PCB) at the two power plants in the Oroville Field Division were out of service for the times and reasons noted:

PCB	Outage Beginning	Outage Ending	Reason
Edward Hyatt Powerplant:			
762	*03/19*	*03/26*	*Re-route alarm and annunciation circuits for a new control system.*
1162	*04/28*	*05/03*	*Modify circuit for the alarm annunciator and data system.*
Thermalito Powerplant:			
662	*05/30*	*06/07*	*Annual maintenance.*

* The following units at the two power plants in the Oroville Field Division were out of service for the times and reasons noted:

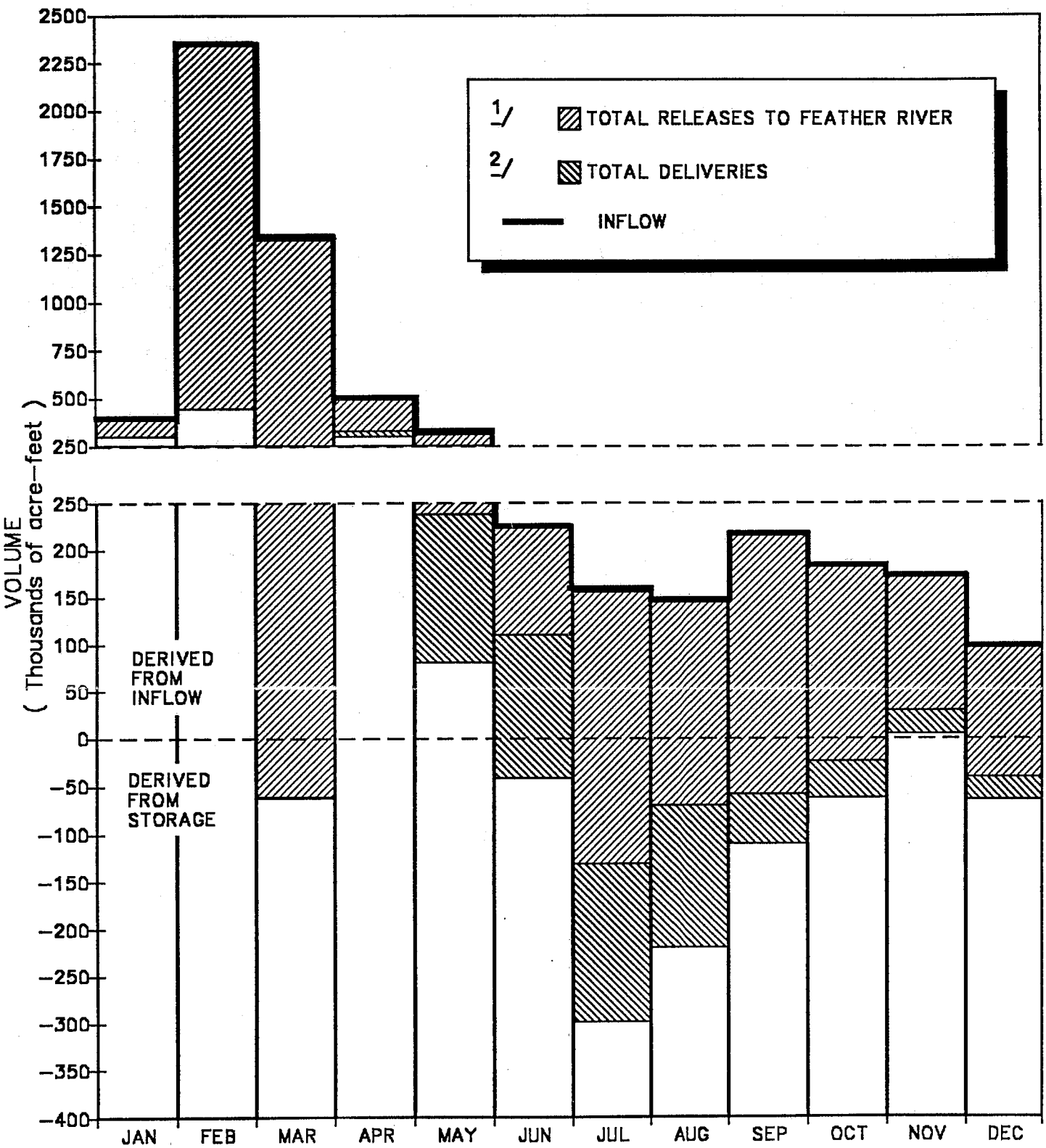
Unit	Outage Beginning	Outage Ending	Reason
Edward Hyatt Powerplant:			
1	03/18	04/05	Annual maintenance and replace the resistance temperature device recorder.
	12/15	12/20	For governor training.
2	1985	01/16	Annual maintenance.
3	04/08	04/21	Annual maintenance.
	12/26	12/29	Repair field breaker.
4	01/21	02/20	Annual maintenance and stator inspection.
	09/25	09/29	Repair leak in turbine.
	10/27	11/10	Annual maintenance and correct turbine pit leakage.
5	04/25	05/14	Annual maintenance and replace resistance temperature device recorder.
Thermalito powerplant:			
1	09/22	11/22	Annual maintenance and replace resistance temperature device recorder.
2	01/10	01/23	Annual maintenance.
4	01/24	02/07	Annual maintenance.

TABLE 6: UPPER FEATHER AREA LAKES
MONTHLY OPERATION
1986

(in acre-feet except as noted)

MONTH	LAKE STORAGE			OUTFLOW							INFLOW
				REGULATED RELEASE							
	WATER SURFACE ELEVATION (in feet)	STORAGE*	STORAGE CHANGE	STREAMFLOW MAINT.	WATER SUPPLY CONTRACT	WATER RIGHT ENTITLEMENT	TOTAL REGULATED RELEASE	SPILL	ESTIMATED EVAPORATION AND SEEPAGE	TOTAL OUTFLOW	COMPUTED OR ESTIMATED
ANTELOPE LAKE	Capacity 22,566 acre-feet										
JAN	4,992.97	15,052	885	1,230	0	0	1,230	0	50	1,280	2,165
FEB	5,003.26	23,752	8,700	1,111	0	0	1,111	4,364	66	5,541	14,241
MAR	5,003.40	23,886	134	1,230	0	0	1,230	17,415	115	18,760	18,894
APR	5,002.87	23,380	-506	1,189	0	0	1,189	10,154	190	11,533	11,027
MAY	5,002.45	22,984	-396	1,227	0	0	1,227	5,229	302	6,758	6,362
JUN	5,001.67	22,259	-725	1,187	0	0	1,187	459	623	2,269	1,544
JUL	5,000.10	20,841	-1,418	1,230	0	0	1,230	0	649	1,879	461
AUG	4,998.01	19,022	-1,819	1,230	0	0	1,230	0	710	1,940	121
SEP	4,997.44	18,545	-477	726	0	0	726	0	357	1,083	606
OCT	4,996.22	17,548	-997	1,159	0	0	1,159	0	253	1,412	415
NOV	4,995.00	16,584	-964	1,190	0	0	1,190	0	126	1,316	352
DEC	4,993.83	15,690	-894	1,230	0	0	1,230	0	84	1,314	420
TOTAL	—	—	1,523	13,939	0	0	13,939	37,621	3,525	55,085	56,608
FRENCHMAN LAKE	Capacity 55,477 acre-feet										
JAN	5,577.12	39,892	1,214	119	0	0	119	0	89	208	1,422
FEB	5,588.62	56,460	16,568	128	0	0	128	111	98	337	16,905
MAR	5,589.17	57,344	884	148	0	0	148	16,644	194	16,986	17,870
APR	5,588.30	55,951	-1,393	2,880	0	0	2,880	5,357	320	8,557	7,164
MAY	5,587.66	54,940	-1,011	1,775	1,047	0	2,822	728	522	4,072	3,061
JUN	5,584.91	50,730	-4,210	0	4,003	0	4,003	1,026	1,026	6,055	1,845
JUL	5,582.64	47,410	-3,320	0	2,848	0	2,848	0	1,050	3,898	578
AUG	5,579.02	42,389	-5,021	0	4,169	0	4,169	0	970	5,139	118
SEP	5,577.59	40,501	-1,888	0	1,566	0	1,566	0	564	2,130	242
OCT	5,577.16	39,943	-558	0	413	0	413	0	402	815	257
NOV	5,576.92	39,634	-309	0	318	0	318	0	206	524	215
DEC	5,576.94	39,660	26	158	15	0	173	0	141	314	340
TOTAL	—	—	982	5,208	14,379	0	19,587	23,866	5,582	49,035	50,017
LAKE DAVIS	Capacity 84,371 acre-feet										
JAN	5,770.73	68,368	2,704	922	0	0	922	0	355	1,277	3,981
FEB	5,774.96	84,210	15,842	4,276	0	0	4,276	0	265	4,541	20,383
MAR	5,774.97	84,250	40	15,140	1	0	15,141	1,600	486	17,227	17,267
APR	5,774.88	83,889	-361	5,288	17	0	5,305	0	800	6,105	5,744
MAY	5,774.86	83,809	-80	883	34	347	1,264	22	1,325	2,611	2,531
JUN	5,774.02	80,479	-3,330	879	70	417	1,366	0	2,776	4,142	812
JUL	5,773.16	77,142	-3,337	799	80	430	1,309	0	2,404	3,713	376
AUG	5,772.21	73,542	-3,600	799	80	430	1,309	0	2,341	3,650	50
SEP	5,771.80	72,016	-1,526	774	27	417	1,218	0	1,225	2,443	917
OCT	5,771.30	70,179	-1,837	1,103	7	0	1,110	0	1,138	2,248	411
NOV	5,770.84	68,511	-1,668	1,190	1	0	1,191	0	652	1,843	175
DEC	5,770.50	67,293	-1,218	1,230	0	0	1,230	0	394	1,624	406
TOTAL	—	—	1,629	33,283	317	2,041	35,641	1,622	14,161	51,424	53,053

FIGURE L: OROVILLE-THERMALITO COMPLEX
1986
INFLOW, RELEASES AND DIVERSIONS



1/ Total of Fish Barrier Dam, Fish Hatchery, and Thermalito Afterbay River Outlet releases.

2/ Total of Palermo Canal, Butte Co., Thermalito Irrigation District, Western Canal, Richvale Canal, P.G.& E. Lateral, and Sutter Butte diversions.

TABLE 7: LAKE OROVILLE MONTHLY OPERATION

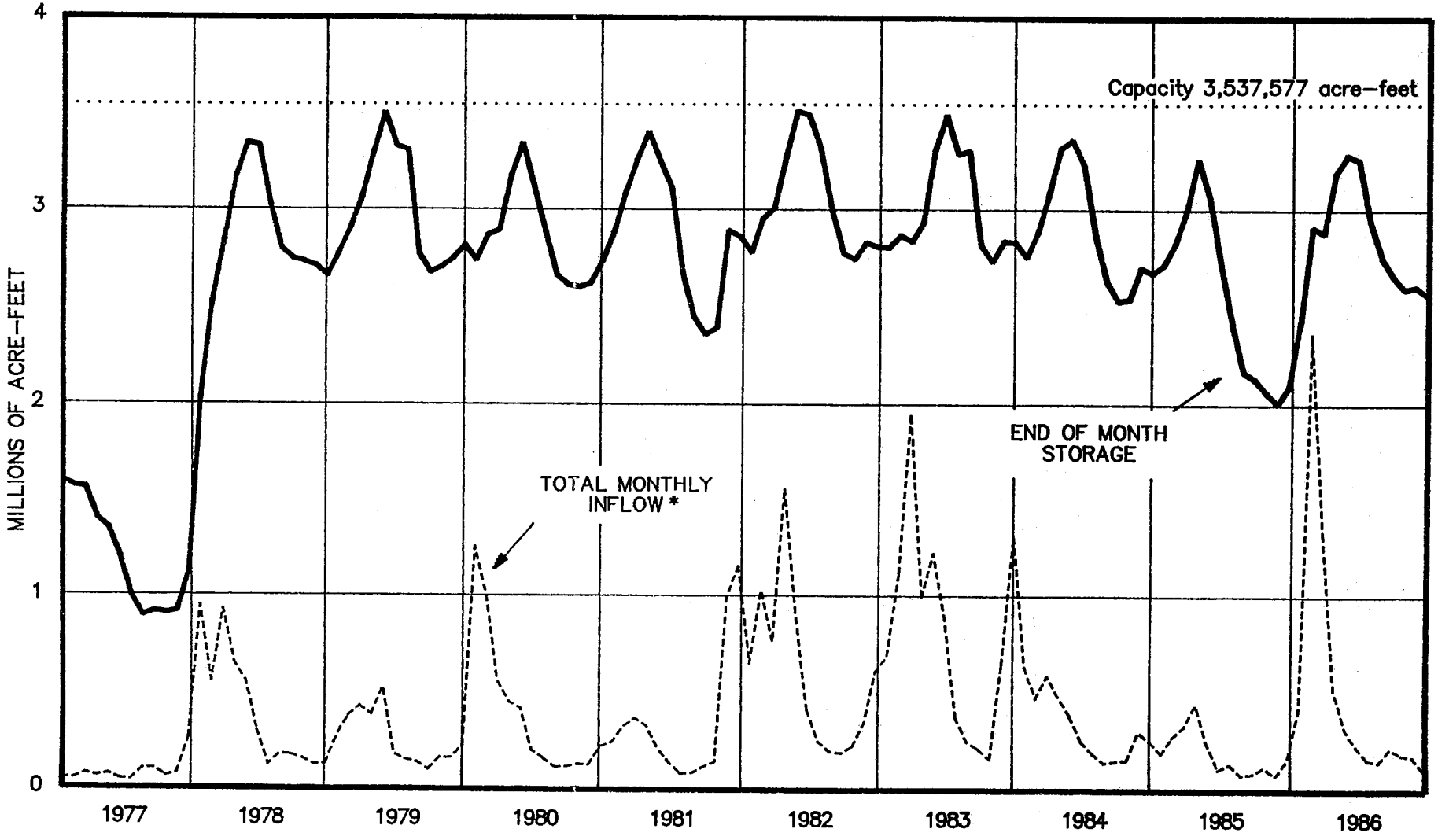
(in acre-feet except as noted)

Capacity 3,537,577 acre-feet

MONTH	YEAR	SURFACE ELEVATION	STORAGE	STORAGE* CHANGE	OUTFLOW						PUMPBACK	INFLOW (excluding pumpback)
					POWER	PALERMO CANAL	SPILLWAY LEAKEAGE	EVAP-ORATION	SPILL	TOTAL OUTFLOW		
JAN	1986	820.31	2,429,331	331,457	78,928	142	14	793	0	79,877	0	411,334
	1985	843.19	2,718,041	45,357	141,452	140	8	724	0	142,324	0	187,681
FEB	1986	857.55	2,910,906	481,575	469,646	122	14	1,098	1,409,685	1,880,565	1,059	2,361,081
	1985	851.59	2,829,731	111,690	158,829	115	87	2,170	0	161,201	0	272,891
MAR	1986	855.32	2,880,344	-30,562	849,503	143	133	2,594	509,920	1,362,293	0	1,331,731
	1985	864.1	3,001,992	172,261	150,834	129	177	2,225	0	153,365	0	325,626
APR	1986	877.41	3,193,260	312,916	228,520	342	555	3,768	0	233,185	31,367	514,734
	1985	882.14	3,263,266	261,274	193,664	516	355	5,220	0	199,755	23,936	437,093
MAY	1986	883.76	3,287,497	94,237	259,171	1,039	1,180	6,821	0	268,211	45,693	316,755
	1985	868.49	3,064,155	-199,111	431,546	1,041	351	7,120	0	440,058	0	240,947
JUN	1986	881.91	3,259,837	-27,660	254,424	1,256	1,289	9,476	0	266,445	12,093	226,692
	1985	843.19	2,718,041	-346,114	444,060	1,018	157	9,133	0	454,368	0	108,254
JUL	1986	860.05	2,945,438	-314,399	482,228	1,244	752	10,424	0	494,648	22,570	157,679
	1985	819.03	2,413,848	-304,193	433,237	1,230	0	9,584	0	444,051	5,297	134,561
AUG	1986	846.15	2,757,039	-188,399	352,977	1,218	204	10,121	0	364,520	29,757	146,364
	1985	798.18	2,171,279	-242,569	326,227	1,230	0	7,932	0	335,389	13,220	79,600
SEP	1986	838.8	2,660,904	-96,135	323,198	952	8	5,556	0	329,714	17,081	216,498
	1985	794.69	2,132,416	-38,863	130,092	824	0	4,696	0	135,612	7,199	89,550
OCT	1986	833.56	2,593,776	-67,128	250,632	851	0	4,588	0	256,071	5,225	183,718
	1985	788.57	2,065,461	-66,955	186,639	658	0	4,149	0	191,446	4,392	120,099
NOV	1986	834.63	2,607,386	13,610	163,310	403	0	3,069	0	166,782	7,347	173,045
	1985	783.18	2,007,745	-57,716	138,131	177	0	1,424	0	139,732	5,476	76,540
DEC	1986	831.21	2,564,058	-43,328	148,134	258	0	858	0	149,250	7,271	98,651
	1985	791.55	2,097,874	90,129	74,914	117	0	616	0	75,647	8,108	157,668
TOTAL	1986	---	---	466,184	3,860,671	7,970	4,149	59,166	1,919,605	5,851,561	179,463	6,138,282
	1985	---	---	-574,810	2,809,625	7,195	1,135	54,993	0	2,872,948	67,628	2,230,510

*At end of month

FIGURE M: LAKE OROVILLE OPERATION



* Excludes pumpback.

FIGURE N: OPERATION OF LAKE OROVILLE FOR FLOOD CONTROL 1985–86

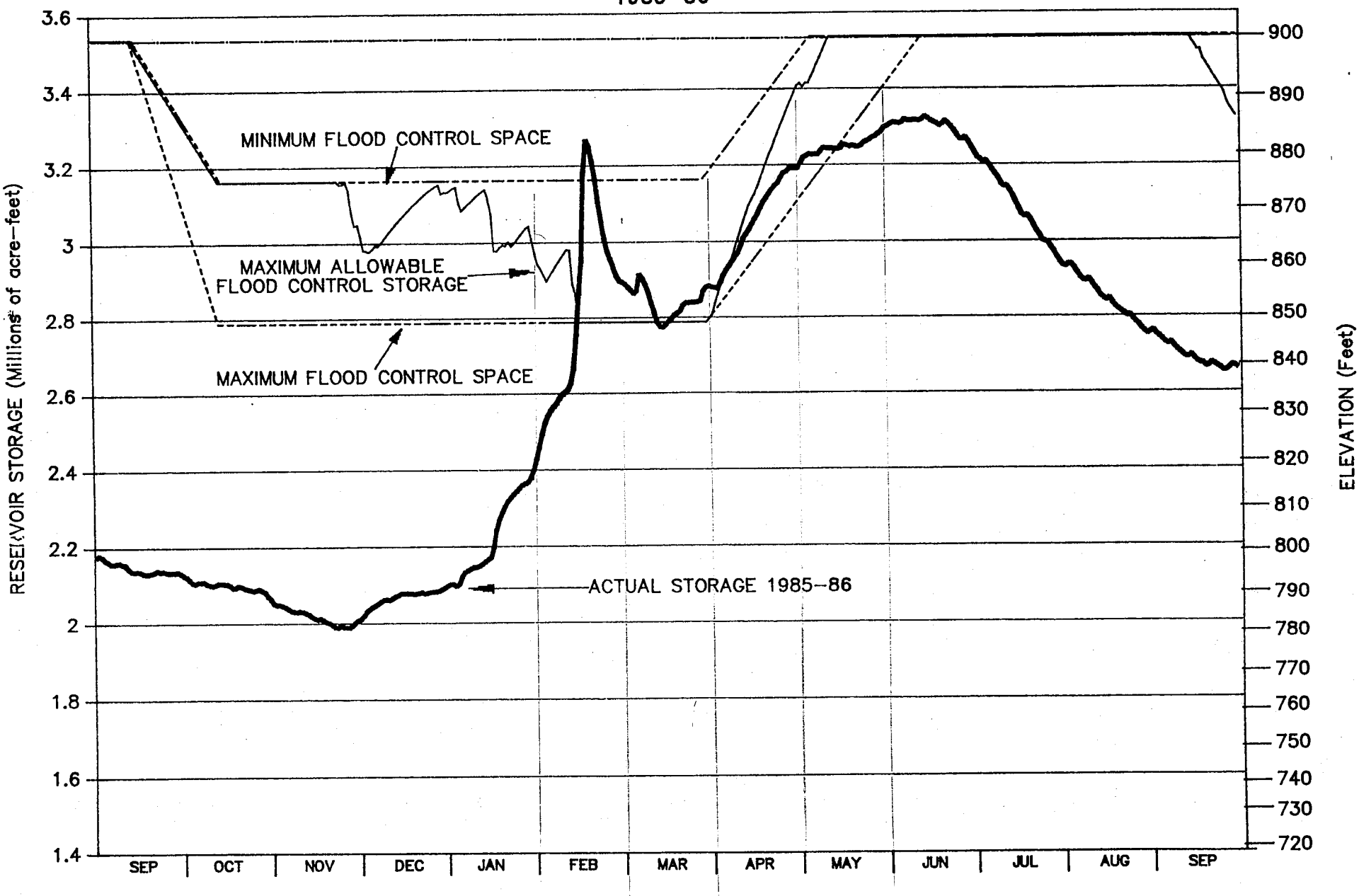


FIGURE O: LAKE OROVILLE ISOTHERMS
1986
(temperature in degrees Fahrenheit)

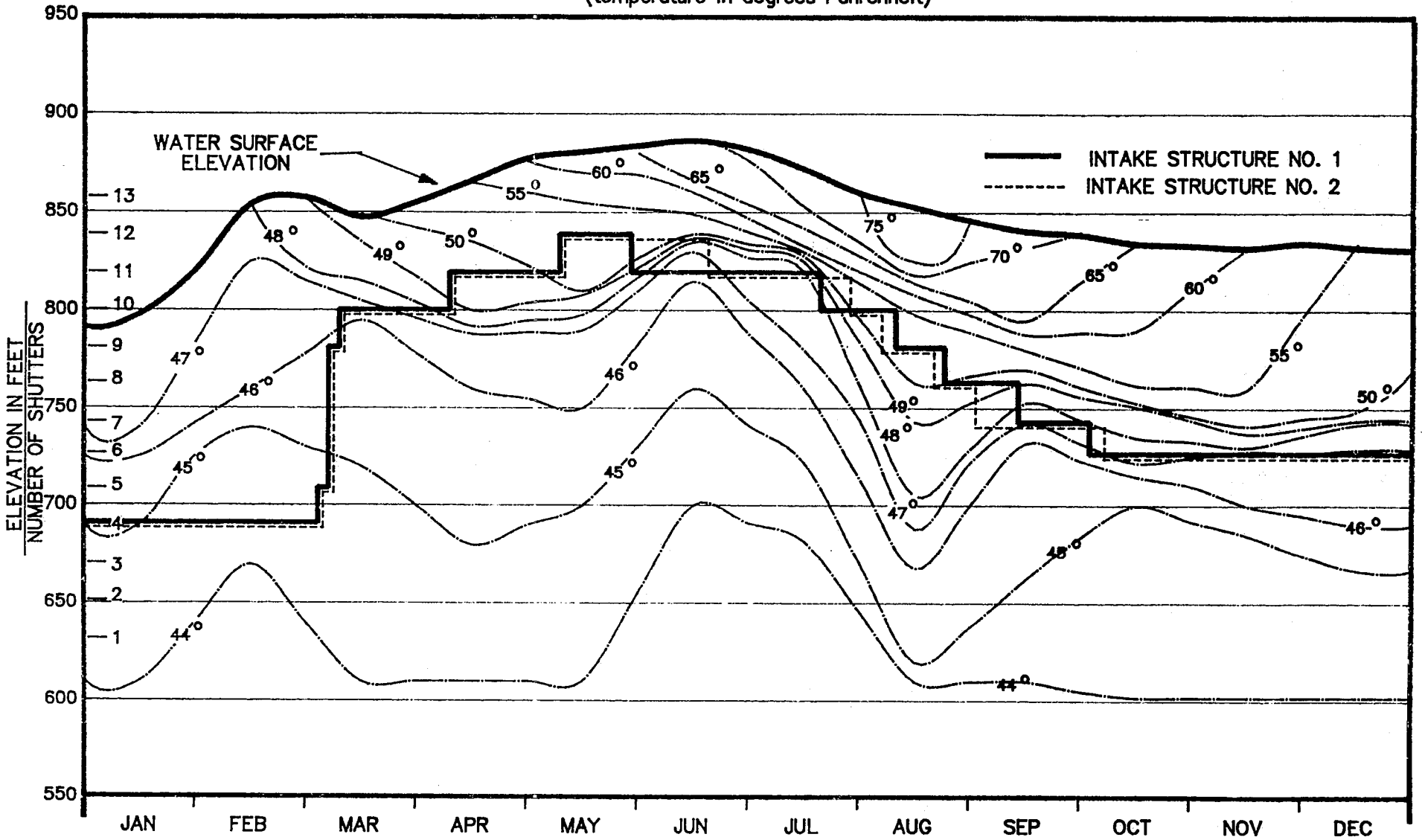


TABLE 8: OROVILLE-THERMALITO COMPLEX MONTHLY STORAGE*

(elevation in feet, storage in acre-feet)

MONTH	YEAR	THERMALITO DIVERSION DAM POOL		THERMALITO FOREBAY		THERMALITO AFTERBAY	
		ELEVATION	STORAGE	ELEVATION	STORAGE	ELEVATION	STORAGE
JAN	1986	223.70	12,936	224.00	11,144	127.91	25,562
	1985	223.92	13,006	223.90	11,083	126.47	21,442
FEB	1986	224.58	13,217	221.48	9,630	131.64	37,818
	1985	222.71	12,623	222.84	10,438	127.54	24,470
MAR	1986	223.73	12,945	223.38	10,764	125.92	19,959
	1985	223.92	13,006	223.92	11,095	134.89	50,290
APR	1986	222.23	12,472	222.02	9,948	129.39	30,154
	1985	223.22	12,783	223.29	10,709	126.54	21,635
MAY	1986	221.83	12,348	221.88	9,865	129.58	30,770
	1985	222.97	12,704	222.64	10,317	127.63	24,735
JUN	1986	223.41	12,844	223.26	10,692	127.31	23,803
	1985	223.04	12,726	223.38	10,764	127.84	25,355
JUL	1986	222.31	12,497	222.58	10,281	134.22	47,592
	1985	223.66	12,923	223.36	10,752	136.00	54,907
AUG	1986	223.51	12,875	223.48	10,825	127.49	24,324
	1985	223.04	12,726	223.18	10,643	134.82	50,006
SEP	1986	223.55	12,888	223.68	10,948	125.66	19,273
	1985	223.92	13,006	223.62	10,911	126.80	22,357
OCT	1986	222.86	12,670	222.76	10,389	128.77	28,187
	1985	223.60	12,904	223.90	11,083	132.34	40,369
NOV	1986	222.97	12,704	222.94	10,498	131.48	37,247
	1985	222.86	12,669	222.92	10,485	135.10	51,152
DEC	1986	223.37	12,831	223.58	10,887	130.90	35,208
	1985	223.30	12,809	223.40	10,777	128.77	28,187

* At end of month.

DELTA FIELD DIVISION

Water Storage

The minimum storage in Lake Del Valle of 24,856 ac-ft occurred on January 1, about 64 percent of the operational storage capacity. The maximum storage of 58,373 ac-ft occurred on February 20, exceeding the operational storage capacity of the lake. Normally, storage above 39,000 ac-ft is flood reservation between November 1 and March 31, and above 40,000 ac-ft is flood reservation between April 1 and October 31. Table 9 on Page 49 and Figure P on Page 50 present reservoir operations for Lake Del Valle in 1986.

Table 10 on Page 51 presents Clifton Court Forebay's monthly operations in 1986.

Water Deliveries

Comparisons of the 1986 water deliveries to the three areas the Delta Field Division serves and their percent reduction from 1985 deliveries are shown in the following table:

Area	*1986 Totals (in ac-ft)*	*Difference from 1985*
California Aqueduct	*5,354*	*-14 %*
North Bay Aqueduct	*3,519*	*-13 %*
South Bay Aqueduct	*136,633*	*-06 %*
Total	*145,506*	

Of the 117,488 ac-ft of entitlement water delivered in the Delta Field Division, 96,444 ac-ft was for municipal and industrial purposes and 21,044 ac-ft was for agricultural use and ground water replacement.

Besides the SWP deliveries, 454 ac-ft of CVP water was wheeled through the California Aqueduct to Tracy Golf and Country Club. Nine ac-ft of CVP water was wheeled to Musco Olive Products Inc.. A total of 130 ac-ft of SWP water was delivered from Lake Del Valle for use at public recreation facilities administered by the East Bay Regional Park District. Table 1 on Page 14 presents water deliveries by year with totals to date for individual agencies.

Pumping Plants

Pumping at Banks Pumping Plant for 1986 totaled 2,467,989 ac-ft, 13 percent less than that pumped during 1985. Of that total, 139,826 ac-ft was pumped for the USBR and consisted of 123,566 ac-ft of D-1485 replacement water, 2,260 ac-ft of Cross Valley Canal Water, and 14,000 ac-ft of Tulare Lake Basin water. 6/.

In complying with D-1485 limitations on Delta diversions described on Page 27, the USBR forgoes up to 193,590 ac-ft of its May-June diversion capacity at its Tracy Pumping Plant. This foregone capacity is then replaced by pumping CVP water at Banks Pumping Plant to the extent needed. As shown in the previous paragraph, only 123,566 ac-ft of CVP water was pumped at Banks Pumping Plant in 1986 to replace CVC capacity foregone in May and June.

Pumping at South Bay Pumping Plant totaled 114,062 ac-ft for 1986, 81 percent of the amount pumped during 1985, while no pumping at Del Valle Pumping Plant took place during 1986. Pumping at Cordelia Interim Pumping Plant totaled 3,480 ac-ft for the year.

Outages and Limitations

Major outages affecting operations of the Delta Field Division in 1986 were:

* Banks Pumping Plant power circuit breaker No. 662 was out of service from June 16 through 25 for five-year maintenance. Banks Pumping Plant power circuit breaker No. 762 was out of service for five-year maintenance from June 27 through July 1.
* South Bay Pumping Plant's stage No. 1 discharge valve hydraulic oil system was out of service from March 3 through 13 to centrifuge the oil.
* Between June 24 and July 24, Del Valle Pumping Plant units were taken out of service one at a time for annual maintenance.
* Cordelia Interim Pumping Plant was out of service from January 7 through 9 and again from February 4 through 6 to install a new 36 inch butterfly valve on the existing 36 inch tee at the base of the Cordelia surge tank for the future connection to the North Bay Aqueduct.

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6 Amounts of water pumped at Banks Pumping Plant for federal contractors may not reflect amounts wheeled for the same time frame, since wheeling and pumping do not necessarily take place concurrently.

* The following units at the pumping plants in the Delta Field Division were out of service for the times and reasons noted:

Unit	Outage Beginning	Outage Ending	Reason
Banks Pumping Plant:			
1	03/10	03/25	Annual maintenance.
2	03/24	04/18	Annual maintenance.
3	02/18	03/21	Re-pack pump.
	04/24	08/22	Repair damaged stator windings.
6	01/13	02/07	Annual maintenance and repair impeller.
	02/24	02/28	Repair leaks in balance line.
	10/13	10/29	Annual maintenance.
7	03/03	03/07	Replace balance line.
	11/02	12/08	Annual maintenance and repair discharge valve upstream seats
South Bay Pumping Plant:			
1	01/06	01/13	Annual maintenance.
2	01/21	01/31	Annual maintenance.
5	02/18	02/28	Annual maintenance.
7	02/10	02/14	Annual maintenance.
8	01/06	01/10	Troubleshoot and repair field application panel.
9	02/24	04/25	Annual maintenance.
Cordelia Interim Pumping Plant:			
1	10/15	11/28	Repair unit discharge valves.
4	08/11	10/15	Overhaul unit discharge valves.
Del Valle Pumping Plant:			
1	06/24	06/30	Annual Maintenance.
2	06/30	07/07	Annual Maintenance.
3	07/07	07/18	Annual Maintenance.
4	07/18	07/24	Annual Maintenance.

TABLE 9: LAKE DEL VALLE MONTHLY OPERATION

1986

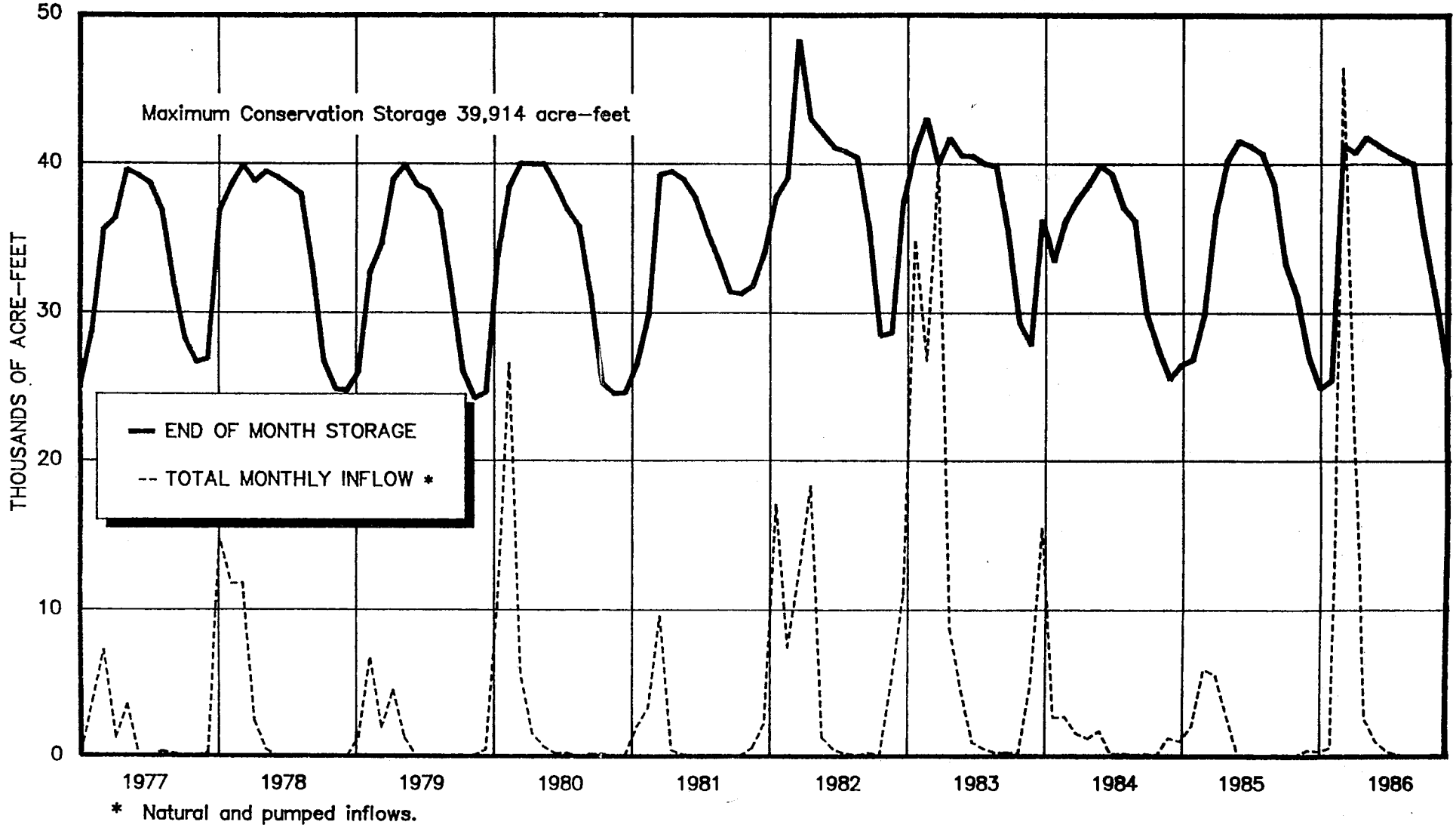
(in acre-feet except as noted)

MONTH	WATER* SURFACE ELEVATION (in feet)	STORAGE*	STORAGE CHANGE	INFLOW		OUTFLOW					PRECIPITATION (inches)
				NATURAL	SOUTH BAY AQUEDUCT	SOUTH BAY AQUEDUCT	RECREATION 1/	ARROYO VALLE	TOTAL	EVAPORATION (in feet)	
JAN	679.32	25,437	581	616	0	0	1	0	1	0.0925	1.77
FEB	704.83	41,222	15,785	46,345	0	0	2	30,494	30,496	0.1458	7.47
MAR	704.14	40,726	-496	21,990	0	3,515	4	18,831	22,350	0.2958	4.41
APR	705.55	41,744	1,018	2,644	0	1,428	8	9	1,445	0.4133	0.52
MAY	704.82	41,215	-529	999	0	224	9	999	1,232	0.6200	0.29
JUN	704.14	40,726	-489	352	0	115	15	352	482	0.7225	0.00
JUL	703.60	40,340	-386	106	0	0	26	23	49	0.8500	0.00
AUG	703.10	39,985	-355	70	0	0	20	0	20	0.7400	0.00
SEP	695.94	35,110	-4,875	55	0	4,576	16	55	4,647	0.5083	0.55
OCT	689.25	30,931	-4,179	118	0	3,960	4	118	4,082	0.4033	0.00
NOV	680.85	26,223	-4,708	129	0	4,546	18	129	4,693	0.2892	0.14
DEC	678.55	25,050	-1,173	157	0	1,124	7	157	1,288	0.1017	0.91
TOTAL	---	---	-387	73,581	0	19,488	130	51,167	70,785	5.1824 Acre Feet	16.06

*At end of month.

1/ To East Bay Regional Park District.

FIGURE P: LAKE DEL VALLE OPERATION



* Natural and pumped inflows.

TABLE 10: CLIFTON COURT FOREBAY MONTHLY OPERATION

(elevation in feet, storage in acre-feet)

MONTH	YEAR	WATER SURFACE ELEVATION*	END OF MONTH STORAGE*	STORAGE CHANGE	INFLOW
JAN	1986	1.88	22,319	3,625	310,129
	1985	1.51	21,519	1,079	116,697
FEB	1986	3.00	24,742	2,423	114,465
	1985	-1.44	15,167	-6,352	193,151
MAR	1986	2.64	23,963	-779	43,402
	1985	-0.96	16,198	1,031	280,409
APR	1986	-0.94	16,241	-7,722	110,833
	1985	-1.54	14,952	-1,246	199,994
MAY	1986	1.43	21,347	5,106	195,672
	1985	-1.15	15,790	838	190,232
JUN	1986	0.40	19,125	-2,222	182,136
	1985	-0.77	16,606	816	202,414
JUL	1986	1.19	20,829	1,704	247,103
	1985	0.30	18,909	2,303	291,093
AUG	1986	0.21	18,715	-2,114	333,425
	1985	0.47	19,276	367	343,355
SEP	1986	-0.15	17,940	-775	377,110
	1985	0.06	18,392	-884	266,857
OCT	1986	1.43	21,347	3,407	212,169
	1985	0.60	19,556	1,164	221,591
NOV	1986	0.90	20,203	-1,144	179,676
	1985	0.96	20,332	776	207,350
DEC	1986	2.10	22,794	2,591	190,724
	1985	0.20	18,694	-1,638	361,574
TOTAL	1986	—	—	+4,100 ~~-6,112~~	2,496,844
	1985	—	—	-1,746	2,874,717

*At end of month.

SAN LUIS FIELD DIVISION

Water Storage

San Luis Reservoir storage reached its maximum of the year, 2,028,217 ac-ft on March 13. Maximum operating storage capacity is 2,027,835 ac-ft. Drawdown reduced the minimum total storage during the year to 1,236,794 ac-ft, on August 24. The State's share of San Luis Reservoir storage reached the maximum of 1,080,151 ac-ft on March 15, while the minimum of 797,119 ac-ft occurred on August 18. Table 11 on Page 55 and Figure Q on Page 56 present San Luis Reservoir operations during 1986. Table 12 on Page 57 presents the monthly operation of O'Neill Forebay during 1986.

Water Deliveries

The only SWP deliveries using joint-use facilities in the San Luis Field Division during 1986 consisted of 450 ac-ft of recreation water. The SWP has no water service contractors who take delivery in the San Luis Field Division. The following tabulation details the two SWP water deliveries in the San Luis Field Division:

Delivery	*Amount (ac-ft)*
Department of Fish and Game.	*440*
Department of Parks and Recreation	*10*

CVP water delivered using joint-use facilities in the San Luis Field Division during 1986 totaled 1,379,815 ac-ft, a four percent increase over the 1985 total. The following tabulation details the CVP water deliveries in the San Luis Field Division:

Delivery	*Amount (ac-ft)*
Federal long term customers.	*1,379,438*
Department of Fish and Game.	*377*

Table 13 on Page 58 presents a monthly operations summary of the State-Federal San Luis Joint-Use facilities.

Pumping Plants

Total pumping in 1986 at the William R. Gianelli Pumping-Generating Plant was 1,266,252 ac-ft, an 11 percent decrease from the amount pumped in 1985. Total water released from San Luis Reservoir to

O'Neill Forebay for generation was 889,596 ac-ft, a 34 percent decrease from the 1985 amount. Total pumping at Dos Amigos Pumping Plant in 1986 was 3,300,172 ac-ft, a 12 percent decrease from the amount pumped in 1985.

Mitigation Water

The SWP's share of wildlife mitigation water for 1986 totaled 4,136 ac-ft. This water was conveyed to the California Department of Fish and Game through the Grasslands Water District and to the Los Banos Gravel Company through the Delta-Mendota Canal, Mendota Pool, and O'Neill Forebay. In addition, the SWP share of wildlife habitat water to the Pilibos Wildlife Habitat Area in 1986 was 141 ac-ft. In 1986, the SWP paid back the USBR for 1985 mitigation water by delivering 3,579 ac-ft of water to the USBR in O'Neill Forebay. The SWP pays back the USBR 55 percent of wildlife mitigation water the year after that water is delivered.

Outages and Limitations

* At William R. Gianelli Pumping-Generating Plant, the No. 1 penstock and units Nos. 1 and 2 were out of service from November 10 through the end of 1986 for caulking behind Unit No. 2 butterfly valve, removal of Unit No. 2 breaker for later installation in Unit No. 3, and for annual maintenance on Unit No. 2. Also, the K4A transformer was out of service from May 21 through 26 for annual maintenance.
* The following PCBs at the two pumping plants in the San Luis Field Division were out of service for the times and reasons noted:

Unit	*Outage Beginning*	*Outage Ending*	*Reason*
William R. Gianelli Pumping-Generating Plant:			
1282	*09/04*	*09/25*	*Repair breaker.*
2382	*09/04*	*09/09*	*Testing breaker timing.*
7882	*10/27*	*11/03*	*Repair interrupter heads.*
2682	*11/04*	*11/08*	*Annual maintenance.*
2786	*11/04*	*11/08*	*Annual maintenance.*
Dos Amigos Pumping Plant:			
1182	*10/30*	*11/05*	*Annual maintenance.*
1486	*10/23*	*10/29*	*Annual maintenance.*

* The following units at the pumping plants in the San Luis Field Division were out of service for the times and reasons noted.

Unit	Outage Beginning	Outage Ending	Reason
William R. Gianelli Pumping-Generating Plant:			
1	02/09	02/25	Restore synchronization.
	05/28	05/30	Replace cotter pin in the operating piston on unit breaker.
	11/07	1987	Repair amortisseur straps.
2	03/14	03/21	Repair leak in head cover.
	11/10	1987	Annual maintenance.
3	02/28	11/24	Annual maintenance and repairs on head cover.
4	02/28	05/28	Annual maintenance.
	10/08	10/14	Repair field connections.
5	10/07	10/22	Inspect and repair amortisseur straps.
6	06/02	06/03	Breaker maintenance.
7	03/23	03/30	Repair blown breaker.
8	04/21	05/07	Replace four rotor poles and repair burnt amortisseur straps.
Dos Amigos Pumping Plant:			
3	08/08	08/20	Annual maintenance.
	09/16	09/23	Relay testing.
4	04/04	04/10	Adjust 25XY timer.
	08/04	08/08	Remove a stator pole piece and inspect wedges.
5	01/17	07/08	Re-wind motor.
6	01/24	01/27	Full load heat run to check new windings.
	03/04	03/05	Adjust 25XY timer.
	04/03	04/10	Change transformer tap to 13.8 KV.

TABLE 11: SAN LUIS RESERVOIR MONTHLY OPERATION

(in acre-feet except as noted)

MONTH	YEAR	RESERVOIR STORAGE*			INFLOW	OUTFLOW			GAIN (+) LOSS (-)	EVAPORATION	PRECIPITATION (in inches)
		WATER SURFACE ELEVATION (in feet)	STORAGE	MONTHLY STORAGE CHANGE	GIANELLI P-G PLANT PUMPING	GIANELLI P-G PLANT GENERATION	PACHECO TUNNEL (future facility)	SPILL			
JAN	1986	530.30	1,868,710	272,751	272,310	0	0	0	441	942	1.23
	1985	520.59	1,750,123	178,082	183,442	0	0	0	-5,360	428	0.97
FEB	1986	538.77	1,974,334	105,624	94,870	0	0	0	10,754	1,918	3.94
	1985	524.36	1,795,846	45,723	61,921	15,043	0	0	-1,155	2,406	0.50
MAR	1986	542.76	2,024,787	50,453	88,630	43,026	0	0	4,849	3,535	2.75
	1985	528.33	1,844,433	48,587	57,446	6,670	0	0	-2,189	3,787	1.34
APR	1986	542.84	2,025,803	1,016	63,097	54,645	0	0	-7,436	6,788	0.11
	1985	523.99	1,791,341	-53,092	14,182	65,042	0	0	-2,232	7,728	0.10
MAY	1986	539.02	1,977,482	-48,321	20,596	61,312	0	0	-7,605	11,227	0.00
	1985	502.77	1,539,573	-251,768	56	249,264	0	0	-2,560	10,225	0.00
JUN	1986	516.79	1,704,450	-273,032	0	267,688	0	0	-5,344	12,333	0.00
	1985	463.81	1,112,344	-427,229	171	428,954	0	0	1,554	11,794	0.12
JUL	1986	489.59	1,389,871	-314,579	0	307,062	0	0	-7,517	12,240	0.00
	1985	424.09	727,162	-385,182	26,876	412,215	0	0	157	11,776	0.00
AUG	1986	476.74	1,248,961	-140,910	19,297	152,895	0	0	-7,312	10,830	0.00
	1985	409.83	603,209	-123,953	47,426	167,944	0	0	-3,345	8,273	0.00
SEP	1986	497.69	1,481,259	232,298	247,457	2,968	0	0	-12,191	7,303	0.59
	1985	428.02	762,777	159,568	168,413	2,194	0	0	-6,651	6,004	0.00
OCT	1986	510.35	1,628,001	146,742	157,851	0	0	0	-11,109	5,248	0.02
	1985	444.93	922,435	159,658	170,065	678	0	0	-9,729	4,366	0.36
NOV	1986	520.83	1,752,022	125,021	133,989	0	77	0	-8,891	3,268	0.02
	1985	468.86	1,165,085	242,650	253,534	3,955	0	0	-6,929	1,708	2.97
DEC	1986	534.15	1,916,471	163,449	168,155	0	0	0	-4,706	930	0.93
	1985	507.62	1,595,959	430,874	441,168	0	0	0	-10,294	607	1.04
TOTAL	1986	---	---	320,512	1,266,252	889,596	77	0	56,067	76,562	9.59
	1985	---	---	23,918	1,424,700	1,351,959	0	0	-48,823	69,102	7.40

* At end of month.

FIGURE Q: SAN LUIS RESERVOIR OPERATION

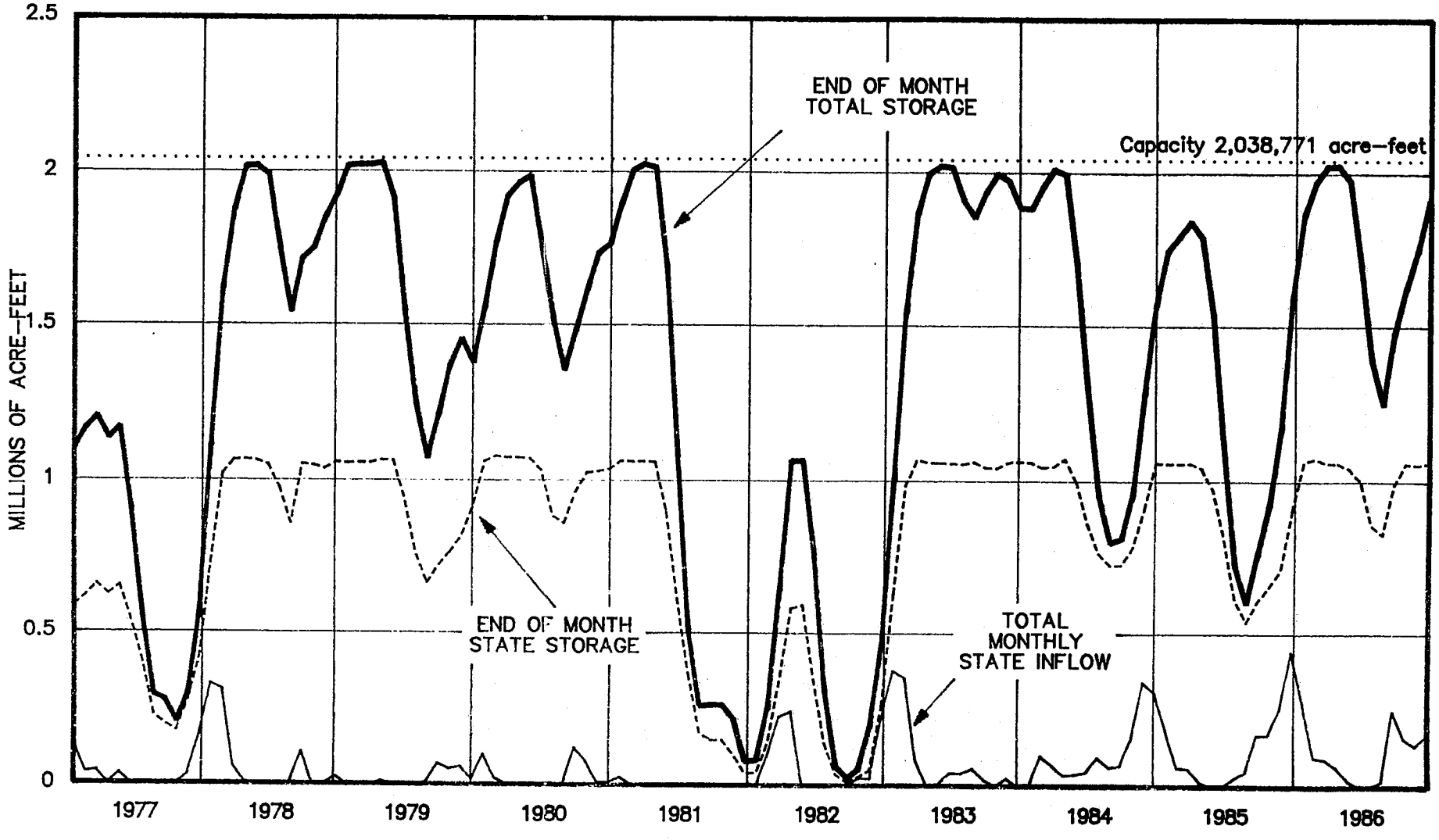


TABLE 12: O'NEILL FOREBAY MONTHLY OPERATION

(In acre-feet except as noted

MONTH	YEAR	RESERVOIR STORAGE			INFLOW			OUTFLOW				GAIN (+) LOSS (-)
		WATER* SURFACE ELEVATION (in feet)	STORAGE*	MONTHLY STORAGE CHANGE	O'NEILL P-G PLANT PUMPING	GIANELLI P-G PLANT GENERATION	CALIFORNIA AQUEDUCT CHECK 12	O'NEILL P-G PLANT GENERATION	GIANELLI P-G PLANT PUMPING	DOS AMIGOS PUMPING	DELIVERIES	
JAN	1986	222.01	48,411	129	209,812	0	299,002	0	272,310	227,788	140	-8,447
	1985	221.39	46,784	814	223,701	0	105,978	0	183,442	146,458	83	1,118
FEB	1986	219.81	42,660	-5,751	200,277	0	105,804	0	94,870	206,950	514	-9,498
	1985	221.26	46,442	-342	146,726	15,043	189,377	0	61,921	291,091	1,128	2,652
MAR	1986	220.97	45,682	3,022	144,526	43,026	41,126	42	88,630	133,662	707	-2,615
	1985	222.52	49,767	3,325	103,790	6,670	263,149	0	57,446	314,184	3,881	5,227
APR	1986	223.69	52,893	7,211	118,177	54,645	110,463	0	63,097	205,744	1,976	-5,257
	1985	220.92	45,551	-4,216	72,233	65,042	181,163	44	14,182	305,499	2,652	-277
MAY	1986	220.72	45,027	-7,866	103,601	61,312	171,422	0	20,596	311,525	2,834	-9,246
	1985	223.95	53,592	8,041	1,914	249,264	167,314	16,502	56	385,212	2,973	-5,708
JUN	1986	220.72	45,027	0	46,973	267,688	162,539	33,669	0	427,483	3,756	-12,292
	1985	221.58	47,283	-6,309	2,900	428,954	178,013	60,212	171	543,135	4,157	-8,501
JUL	1986	221.64	47,441	2,414	3,359	307,062	220,987	6,111	0	509,572	4,456	-8,855
	1985	222.29	49,155	1,872	5,713	412,215	263,803	3,464	26,876	632,315	5,162	-12,042
AUG	1986	221.92	48,176	735	25,728	152,895	312,525	1,271	19,297	459,965	5,404	-4,476
	1985	222.97	50,966	1,811	52,189	167,944	322,325	0	47,426	478,025	4,292	-10,904
SEP	1986	221.58	47,283	-893	107,628	2,968	364,300	0	247,457	223,922	1,711	-2,699
	1985	221.21	46,311	-4,655	126,187	2,194	255,783	0	168,413	210,533	1,713	-8,160
OCT	1986	221.92	48,176	893	124,208	0	201,568	0	157,851	165,816	417	-799
	1985	223.41	52,142	5,831	129,905	678	206,847	0	170,065	159,778	751	-1,005
NOV	1986	221.78	47,809	-367	163,002	0	175,691	0	133,989	203,298	164	-1,609
	1985	223.33	51,928	-214	203,574	3,955	201,662	0	253,534	150,641	615	-4,615
DEC	1986	223.32	51,901	4,092	227,171	0	177,828	0	168,155	224,447	178	-8,127
	1985	221.96	48,282	-3,646	236,188	0	358,151	0	441,168	153,907	48	-2,862
TOTAL	1986	—	—	3,619	1,474,462	889,596	2,343,255	41,093	1,266,252	3,300,172	22,257	-73,920
	1985	—	—	2,312	1,305,020	1,351,959	2,693,565	80,222	1,424,700	3,770,778	27,455	-45,077

* At end of month.

TABLE 13: MONTHLY OPERATIONS SUMMARY, STATE-FEDERAL SAN LUIS JOINT-USE FACILITIES
1986

(in acre-feet except as noted)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
Check 12													
State	282,742	105,804	41,126	110,463	171,422	162,539	149,545	260,401	364,300	201,568	175,691	177,828	2,203,429
Federal	16,260	0	0	0	0	0	71,442	52,124	0	0	0	0	139,826
Total	299,002	105,804	41,126	110,463	171,422	162,539	220,987	312,525	364,300	201,568	175,691	177,828	2,343,255
O'Neill P-G Plant Amount Pumped													
State	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal	209,812	200,277	144,526	118,177	103,601	46,973	3,359	25,728	107,628	124,208	163,002	227,171	1,474,462
Total	209,812	200,277	144,526	118,177	103,601	46,973	3,359	25,728	107,628	124,208	163,002	227,171	1,474,462
Released for Generation													
Federal	0	0	42	0	0	33,669	6,111	1,271	0	0	0	0	41,093
O'Neill Forebay Storage*													
State	23,959	17,424	16,677	20,006	18,614	8,080	13,667	15,858	21,843	20,884	25,887	21,016	xxxx
Federal	24,452	25,236	29,005	32,887	26,413	36,947	33,774	32,318	25,440	27,292	21,922	30,885	xxxx
Total	48,411	42,660	45,682	52,893	45,027	45,027	47,441	48,176	47,283	48,176	47,809	51,901	xxxx
Gianelli Reservoir Storage*													
State	1,065,714	1,075,958	1,061,729	1,060,886	1,004,475	1,044,545	859,195	828,179	993,209	1,060,969	1,056,544	1,062,590	xxxx
Federal	802,996	898,376	963,058	964,917	933,007	699,905	530,676	420,782	488,050	567,032	696,478	853,881	xxxx
Total	1,868,710	1,974,334	2,024,787	2,025,803	1,937,482	1,744,450	1,389,871	1,248,961	1,481,259	1,628,001	1,753,022	1,916,471	xxxx
Gianelli P-G Plant Amount Pumped													
State	158,712	4,329	863	3,556	15,158	0	0	19,297	171,874	73,870	507	8,634	456,800
Federal	113,598	90,541	87,767	59,541	5,438	0	0	0	75,583	83,981	133,482	159,521	809,452
Total	272,310	94,870	88,630	63,097	20,596	0	0	19,297	247,457	157,851	133,989	168,155	1,266,252
Released for Generation													
State	0	0	-241	309	27,386	36,991	141,216	59,892	139	0	0	0	265,692
Federal	0	0	43,267	54,336	33,926	230,697	165,846	93,003	2,829	0	0	0	623,904
Total	0	0	43,026	54,645	61,312	267,688	307,062	152,895	2,968	0	0	0	889,596
Dos Amigos P.P. Amount Pumped													
State	118,945	102,786	59,174	100,996	179,957	203,303	276,705	281,343	182,268	128,218	169,296	169,595	1,972,586
Federal	108,843	104,164	74,488	104,748	131,568	224,180	232,867	178,622	41,654	37,598	34,002	54,852	1,327,586
Total	227,788	206,950	133,662	205,744	311,525	427,483	509,572	459,965	223,922	165,816	203,298	224,447	3,300,172

* At end of month.

SAN JOAQUIN FIELD DIVISION

Water Deliveries

Out of 1,097,447 ac-ft of SWP water delivered to SWP water service contractors in the San Joaquin Field Division during 1986, about 96 percent was entitlement water, one percent was surplus water, two percent was unscheduled water, and one percent was 1977 emergency relief and pre-consolidation repayment water. The largest delivery (929,278 ac-ft) was to the Kern County Water Agency, which represented 85 percent of the total SWP water delivered within the Division. Of the total entitlement water delivered in the San Joaquin Field Division, 973,176 ac-ft (about 92%) was for agricultural purposes. Besides SWP deliveries, 17,050 ac-ft of CVP water was wheeled through SWP facilities to USBR customers in the San Joaquin Field Division. Table 1 on Page 14 presents water deliveries by year with totals to date for individual agencies.

Pumping plants

The following table presents the total pumping at the six pumping plants in the San Joaquin Field Division during 1986 and their percent differences from 1985 totals:

Pumping Plant	*1986 Total (ac-ft)*	*Difference from 1985 (percent)*
Coastal Branch:		
Las Perillas	*144,338*	*+4*
Badger Hill	*144,307*	*+6*
California Aqueduct:		
Buena Vista	*1,077,310*	*-9*
Wheeler Ridge	*947,312*	*-10*
Ira J. Chrisman Wind Gap	*907,525*	*-10*
A. D. Edmonston	*886,250*	*-10*

Decreased pumping in the California Aqueduct reflects the wet water conditions in 1986 compared with the dry year of 1985.

Outages and Limitations

Major outages affecting operations of the San Joaquin Field Division in 1986 were:

California Aqueduct:

* At Buena Vista Pumping Plant, the No. 1 discharge line and Units Nos. 1, 2, and 3 were out of service from October 21 through 24 to remove Unit No. 3 bumped head and reinstall the discharge valve after annual maintenance.
* At Wheeler Ridge Pumping Plant, the No. 1 discharge line and Units Nos. 1, 2, and 3 were out of service from January 21 through February 6 to remove Units Nos. 1 and 2 bumped heads and replace the discharge valves.
* At Ira J. Chrisman Wind Gap Pumping Plant, the No. 1 discharge line and Units Nos. 1, 2, and 3 were out of service twice in 1986: From April 26 through May 6 to repair Unit No. 2 discharge valve seats; and from June 29 through July 22 to reinstall Unit No. 2 discharge valve. The No. 2 discharge line and Units Nos. 4 and 5 were out of service from 1985 through March 7 to replace Unit No. 5 discharge valve. The No. 4 discharge line and Units Nos. 8 and 9 were out of service from August 11 through 19 to remove Unit No. 9 discharge valve in order to repair seats and install a bumped head. Also, the KYB transformer (and Units Nos. 4 and 5) were out of service from November 3 through 6 for annual maintenance and a Doble test on the transformer.
* At A.D. Edmonston Pumping Plant, the west discharge line was out of service on three occasions in 1986: from 1985 through January 15 to remove Units Nos. 6 and 8 discharge valves and place bumped heads; from April 28 through July 13 to remove bumped heads from Units Nos. 6 and 8 and replace discharge valves, and remove Units Nos. 2 and 4 discharge valves and place bumped heads; and from October 1 through November 6 to replace Units Nos. 2 and 4 discharge valves. Power circuit breaker No. 218 was out of service from April 28 through June 26 to be replaced. Power circuit breaker No. 1212 and Unit No. 12 were out of service from April 2 through May 1 to add solenoid to breaker air system.

* The following units at the California Aqueduct's four pumping plants in the San Joaquin Field Division were out of service for the times and reasons noted.

Unit	Outage Beginning	Outage Ending	Reason
Buena Vista Pumping Plant:			
3	10/24	11/28	Annual maintenance.
8	03/24	10/24	Repair impeller and discharge valve and for annual maintenance.
Wheeler Ridge Pumping Plant:			
2	12/08	1987	Reinstall discharge valve and grind and weld rust spots on the inside of the manifold at the discharge valve.
Ira J. Chrisman Wind Gap Pumping Plant:			
2	01/13	01/17	Repair leak in high-pressure balance line.
	04/14	08/08	Replace amortisseur straps and inspect impeller.
	10/02	10/09	Repair leak in balance line flange.
4	12/02	1987	Repair leak in No. 2 discharge line.
5	1985	03/17	Annual maintenance to include cleaning out discharge valve hydraulic system, replace seats, replace impeller, and re-wedge motor.
6	10/01	10/10	Replace back-fill line.
7	08/05	08/15	Inspect impeller.
	11/21	12/17	Repair discharge valve.
9	08/11	09/15	Repair discharge valve and annual maintenance.
A. D. Edmonston Pumping Plant:			
2	1985	02/04	Repair damaged bearings.
	04/28	11/05	Repair discharge valve seats.
4	02/15	12/01	Repair discharge valve.
5	11/07	1987	Pump overhaul.
7	07/16	07/28	Repair exciter field breaker.
10	01/21	04/07	Remove internal oil cooler from thrust bearing tub, installed external oil coolers and oil baffles in the tub.
12	04/28	07/01	Remove internal oil cooler from thrust bearing tub, installed external oil coolers and oil baffles in the tub.
	12/19	12/24	Replace "O" ring seals in timing valve on discharge valve hydraulic system.
13	08/01	09/30	Install diagnostic equipment.
14	05/06	07/01	Remove internal oil cooler from thrust bearing tub, installed external oil coolers and oil baffles in the tub.

Coastal Branch:

* The following units at the Coastal Branch's two pumping plants in the San Joaquin Field Division were out of service for the times and reasons noted:

Unit	Outage Beginning	Outage Ending	Reason
Las Perillas Pumping Plant:			
4	11/12	1987	Annual maintenance.
Badger Hill Pumping Plant:			
1	01/02	02/02	Annual maintenance.
4	10/07	11/07	Annual maintenance.
5	10/23	1987	Pull motor and inspect windings and impeller.

SOUTHERN FIELD DIVISION

Water Storage

At the start of 1986, total combined reservoir storage in the Southern Field Division's five reservoirs (Pyramid Lake, Elderberry Forebay, Castaic Lake, Silverwood Lake, and Lake Perris) was 642,098 ac-ft, or 93 percent of the maximum combined operational capacity (689,021 ac-ft). Combined storage at the end of the year was 677,935 ac-ft, or 98 percent of the maximum combined operational capacity. In addition, 42,064 ac-ft of natural flow was released from the Project's southern reservoirs in 1986.

A table of reservoir storages for the Southern Field Division follows with summaries of operations for these reservoirs on pages 65 through 73:

Reservoir	*01/01/86 (ac-ft)*	*12/31/86 (ac-ft)*	*Maximum (ac-ft)*	*Date*	*Minimum (ac-ft)*	*Date*
Pyramid Lake	*161,083*	*163,942*	*169,488*	*9/1*	*154,891*	*6/27*
Elderberry Forebay	*24,467*	*18,739*	*30,970*	*6/27*	*18,739*	*12/31*
Castaic Lake	*272,160*	*299,168*	*321,758*	*3/20*	*238,066*	*9/2*
Silverwood Lake	*68,632*	*72,235*	*73,697*	*3/10*	*64,578*	*5/3*
Lake Perris	*115,756*	*123,851*	*126,109*	*3/19*	*97,489*	*10/4*

Water Deliveries

Total deliveries to SWP water service contractors in the Southern Field Division was 827,350 ac-ft, 98 percent of the amount delivered in 1985. This total included 3,285 ac-ft of SWP recreation water. Of the total entitlement water delivered within the division, 720,272 ac-ft was for municipal and industrial purposes.

SWP recreation water delivered in 1986 consisted of 2,662 ac-ft to the California Department of Parks and Recreation (130 ac-ft at Silverwood Lake, 1,378 ac-ft at Lake Perris, 20 ac-ft at Pyramid Lake, and 1,134 ac-ft released to maintain a trout fishery in Piru Creek). An additional 623 ac-ft was delivered to Los Angeles County Recreation Department at Castaic Lake. Table 1 on Page 14 presents water deliveries by year with totals to date for individual agencies.

Outages and Limitations

Major outages affecting operations in the Southern Field Division in 1986 were:

West Branch:

* At William E. Warne Powerplant, transformer KY1B was out of service from January 2 through 7; transformer KYA was out of service from June 23 through July 7; and transformers KY2 and K2B from August 4 through 13.

* The following units were out of service for the times and reasons noted.

Unit	Outage Beginning	Outage Ending	Reason
Oso Pumping Plant:			
2	08/28	09/02	Regulate cooling water pressure.
	10/17	11/08	Repair air release valve.
4	02/18	1987	Replace impeller.
5	05/12	06/02	Annual maintenance.
7	05/09	05/13	Repair brakes.
	06/17	11/19	Annual maintenance and replace discharge valve seats.
William E. Warne Powerplant:			
1	03/03	03/07	Modify cooling water return lines.
	06/16	07/08	Annual maintenance.
2	03/03	03/07	Modify cooling water return lines.
	07/22	08/22	Annual maintenance.

East Branch:

* The Alamo Powerplant was out of service from October 27 through 31 for equipment measurements and calibrations.
* At Pearblossom Pumping Plant, the No. 2 discharge line and Units Nos. 4, 5, and 6 were out of service from April 2 through 15 to repair the surge chamber four inch air compressor lines and check the valves.
* The Devil Canyon Powerplant was out of service from December 8 through 12 to overhaul the power circuit breaker No. 142.
* The following units were out of service for the times and reasons noted:

Unit	Outage Beginning	Outage Ending	Reason
Pearblossom Pumping Plant:			
1	03/31	05/05	Annual maintenance.
2	05/05	05/30	Annual maintenance.
3	02/07	02/28	Inspect lower motor guide bearings.
	06/02	06/27	Annual maintenance.
4	03/04	04/04	Annual maintenance.
	09/30	10/02	Inspect and adjust upper and lower motor guide bearings.
5	02/03	03/31	Replace impeller, repair runner stay vanes, and annual maintenance.
6	01/07	01/30	Annual maintenance.
Devil Canyon Powerplant:			
1	01/13	01/31	Annual maintenance.
	12/01	12/24	Annual maintenance.
2	02/05	02/28	Annual maintenance.

TABLE 14: PYRAMID LAKE MONTHLY OPERATION
1986

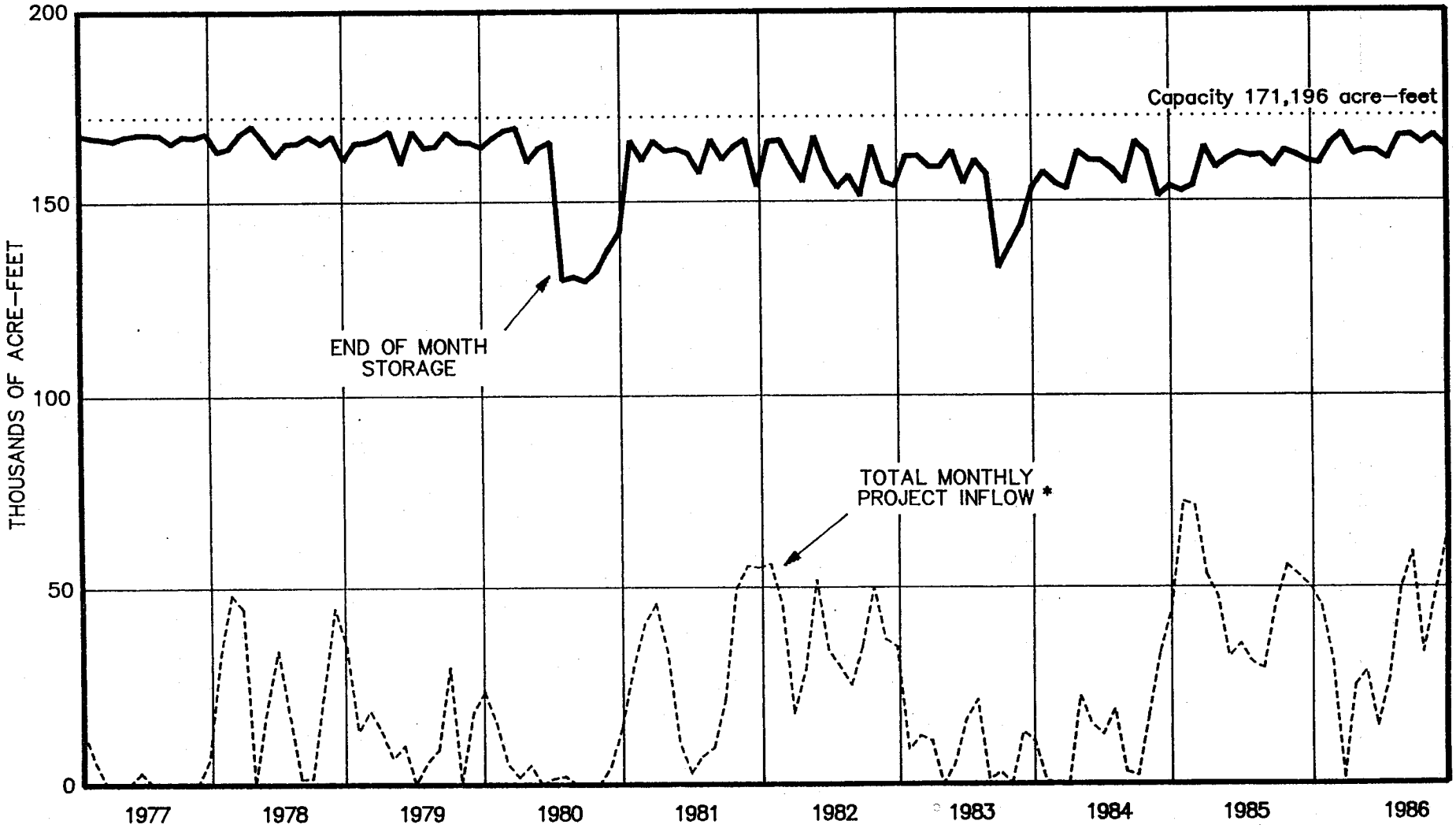
(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet)	TOTAL STORAGE	NATURAL INFLOW STORAGE SHARES	STORAGE CHANGE	INFLOW			OUTFLOW				COMPUTED LOSSES (-) GAINS (+)
						PROJECT			TO PIRU CREEK			
					NATURAL	WARNE POWER-PLANT	PUMPBACK 1/	ANGELES TUNNEL	NATURAL INFLOW RELEASE 2/	RECREATION (METERED WATER)	PROJECT WATER FOR FISH ENHANCEMENT	
JAN	2569.86	159,604	1,043	-608	3,222	45,176	0	44,668	1,925	0	0	-2,413
FEB	2573.86	164,611	1,694	5,007	13,777	31,305	0	25,602	13,126	2	0	-1,345
MAR	2576.01	167,345	3,522	2,734	5,750	1,457	12,334	12,014	3,922	0	0	-871
APR	2571.75	161,958	2,352	-5,387	3,118	25,088	10,319	37,886	4,288	1	0	-1,737
MAY	2572.53	162,935	1,180	977	1,096	28,742	61,919	84,881	2,268	2	0	-3,629
JUN	2572.37	162,734	834	-201	418	14,590	68,857	80,071	764	0	0	-3,231
JUL	2570.75	160,710	354	-2,024	272	26,541	5,465	30,951	752	5	0	-2,594
AUG	2575.46	166,643	0	5,933	241	49,985	2,084	43,036	595	5	317	-2,424
SEP	2575.65	166,885	0	242	324	59,058	1,916	56,906	324	0	349	-3,477
OCT	2573.96	164,738	0	-2,147	390	33,354	43	32,989	390	0	263	-2,292
NOV	2575.60	166,821	117	2,083	617	48,307	75	43,961	500	4	0	-2,451
DEC	2573.36	163,980	241	-2,841	574	63,416	752	65,148	450	1	0	-1,984
TOTAL	---	---	---	3,768	29,799	427,019	163,764	558,113	29,304	20	929	-28,448

1/ Pumpback by Los Angeles Department of Water and Power (LADWP) from Elderberry Forebay thru Castaic powerplant.

2/ Portion of theses amounts used to satisfy fishery enhancement agreement.

FIGURE R: PYRAMID LAKE OPERATION



* Excludes pumpback by LADWP through Castaic Powerplant.

TABLE 15: ELDERBERRY FOREBAY MONTHLY OPERATION
1986

(In acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (In feet)	TOTAL STORAGE	STORAGE CHANGE	INFLOW		OUTFLOW		PUMPBACK TO PYRAMID LAKE 1/	COMPUTED LOSSES (-) GAINS (+)
				CASTAIC POWERPLANT GENERATION	NATURAL	TO CASTAIC LAKE			
						NATURAL	PROJECT		
JAN	1,521.80	23,707	-1,837	44,668	643	643	46,600	0	95
FEB	1,516.60	21,534	-2,173	25,602	4,532	4,532	21,398	0	-6,377
MAR	1,519.50	22,732	1,198	12,014	2,520	1,287	0	12,334	285
APR	1,523.60	24,485	1,753	37,886	728	1,961	24,736	10,319	155
MAY	1,525.17	25,740	1,255	84,881	157	157	23,210	61,919	1,503
JUN	1,517.61	22,513	-3,227	80,071	11	11	15,709	68,857	1,268
JUL	1,520.45	23,697	1,184	30,951	0	0	24,675	5,465	373
AUG	1,514.50	21,252	-2,445	43,036	0	0	43,416	2,084	19
SEP	1,513.17	20,725	-527	56,906	0	0	55,987	1,916	470
OCT	1,517.39	22,422	1,697	32,989	0	0	31,287	43	38
NOV	1,511.74	20,164	-2,258	43,961	5	5	46,183	75	39
DEC	1,507.20	18,739	-1,425	65,148	13	13	66,119	752	298
TOTAL	---	---	-6,805	558,113	8,609	8,609	399,320	163,764	-1,834

1/ Pumpback by Los Angeles Department of Water and Power (LADWP) thru Castaic Power Plant.

TABLE 16: CASTAIC LAKE MONTHLY OPERATION

1986

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet)	TOTAL STORAGE 1/	NATURAL INFLOW STORAGE	STORAGE CHANGE	INFLOW			OUTFLOW		DISPOSITION OF NATURAL INFLOW		COMPUTED LOSSES (-) GAINS (+)
					NATURAL	FROM ELDERBERRY FOREBAY		DELIVERIES	RELEASED TO CASTAIC AFTERBAY	RELEASED FROM CASTAIC AFTERBAY		
						NATURAL	PROJECT			SURFACE	SUBSURFACE	
JAN	1500.24	291,691	980	21,100	579	643	46,600	27,015	1,481	1,203	184	1,774
FEB	1513.89	321,223	10,035	29,532	4,973	4,532	21,398	7,924	439	283	167	6,992
MAR	1512.54	318,228	15,221	-2,995	4,118	1,287	0	8,143	382	35	184	125
APR	1510.25	313,184	17,017	-5,044	1,103	1,961	24,736	31,055	1,371	1,090	178	-418
MAY	1499.95	291,081	90	-22,103	382	157	23,210	46,176	915	806	184	1,239
JUN	1489.27	269,163	74	-21,918	136	11	15,709	37,380	241	0	163	-153
JUL	1477.22	245,551	0	-23,612	38	0	24,675	48,905	353	0	112	933
AUG	1474.36	240,119	0	-5,432	9	0	43,416	49,079	307	0	9	529
SEP	1482.48	255,712	0	15,593	42	0	55,987	40,427	269	0	42	260
OCT	1482.07	254,912	0	-800	72	0	31,287	31,309	100	0	72	-750
NOV	1488.02	266,658	0	11,746	96	5	46,183	33,765	299	0	101	-474
DEC	1503.83	299,296	0	32,638	119	13	66,119	32,422	101	0	132	-1,090
TOTAL	—	—	—	28,705	11,667	8,609	399,320	393,600	6,258	3,417	1,528	8,967

FIGURE S: CASTAIC LAKE OPERATION

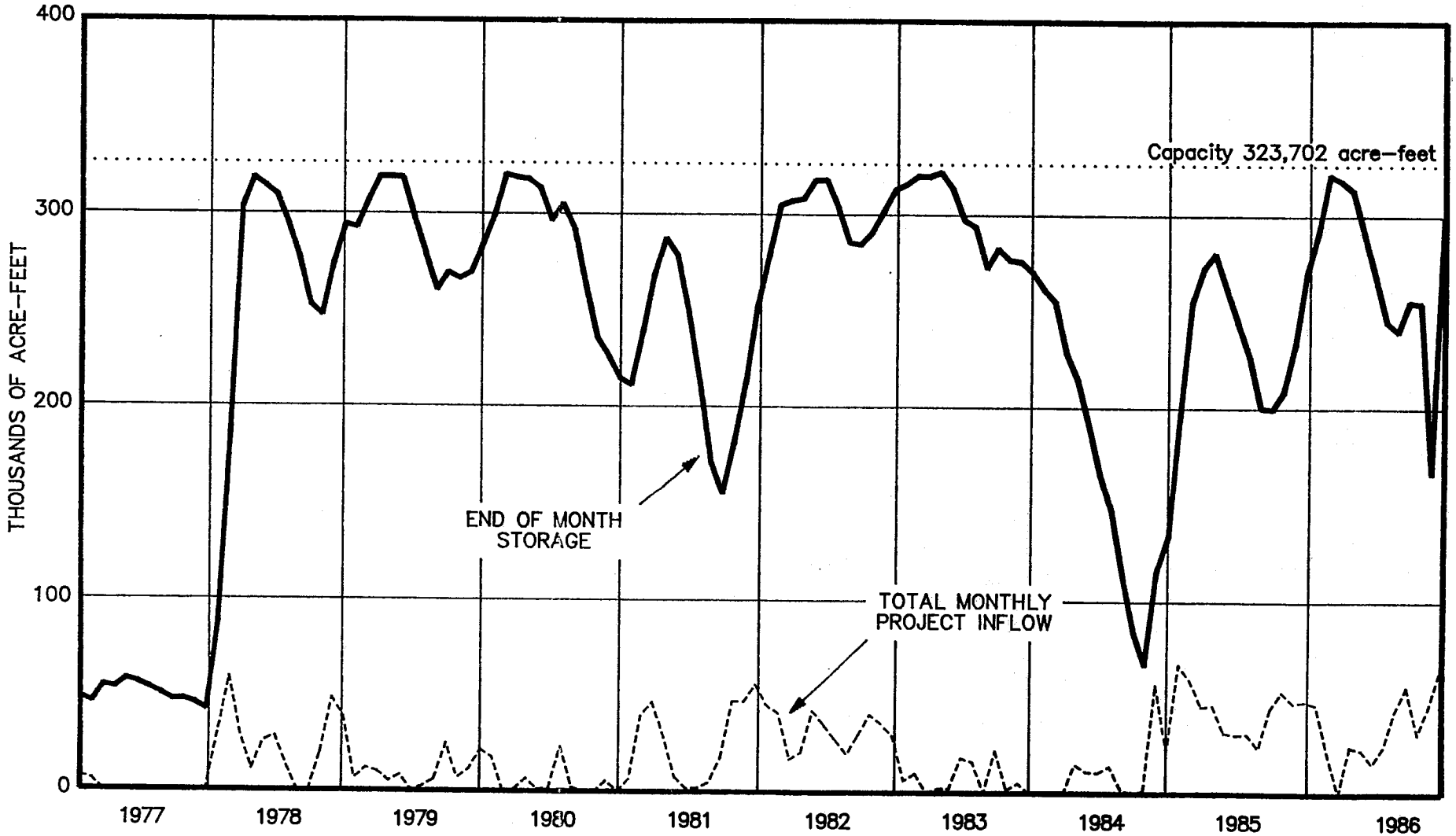


TABLE 17: SILVERWOOD LAKE MONTHLY OPERATION
1986

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet)	STORAGE	NATURAL INFLOW STORAGE SHARES	STORAGE CHANGE	INFLOW		OUTFLOW			COMPUTED LOSSES (-) GAINS (+)	NATURAL INFLOW EXCHANGED OR RELEASED 1/
					NATURAL	PROJECT	SAN BERNARDINO TUNNEL	AT TURNOUT (CLAWA)	NATURAL INFLOW TO MOJAVE RIVER		
JAN	3,351.58	71,672	807	3,365	607	24,587	21,661	129	14	-25	225
FEB	3,348.72	68,977	1,917	-2,695	4,804	17,417	22,466	103	3,490	1,143	3,694
MAR	3,353.46	73,475	3,226	4,498	4,442	10,515	8,464	68	2,357	430	3,133
APR	3,344.06	64,704	2,907	-8,771	2,032	5,650	14,955	85	1,275	-138	2,351
MAY	3,349.70	69,894	1,885	5,190	653	55,636	52,164	153	583	1,801	1,675
JUN	3,349.60	69,800	1,238	-94	147	42,869	44,205	169	13	1,277	794
JUL	3,348.00	68,307	748	-1,493	4	44,803	46,584	202	13	499	494
AUG	3,349.72	69,913	435	1,606	0	43,644	43,107	222	15	1,306	295
SEP	3,351.20	71,311	174	1,398	14	52,980	53,000	171	13	1,588	293
OCT	3,345.02	65,573	93	-5,738	65	37,270	46,151	120	15	3,213	146
NOV	3,351.98	72,054	106	6,481	88	46,390	40,677	111	13	804	75
DEC	3,352.16	72,226	163	172	198	18,050	18,419	100	14	457	141
TOTAL	---	---	---	3,919	13,054	399,811	411,853	1,633	7,815	12,355	13,316

1/ Total releases made from Mojave Siphon to Las Flores Ranch Co., in exchange for natural inflow stored in lake, and from Silverwood Lake to Mojave River from outlet for Mojave W.W. The difference between this total column and the natural inflow released to Mojave River equals the Las Flores Ranch.

FIGURE T: SILVERWOOD LAKE OPERATION

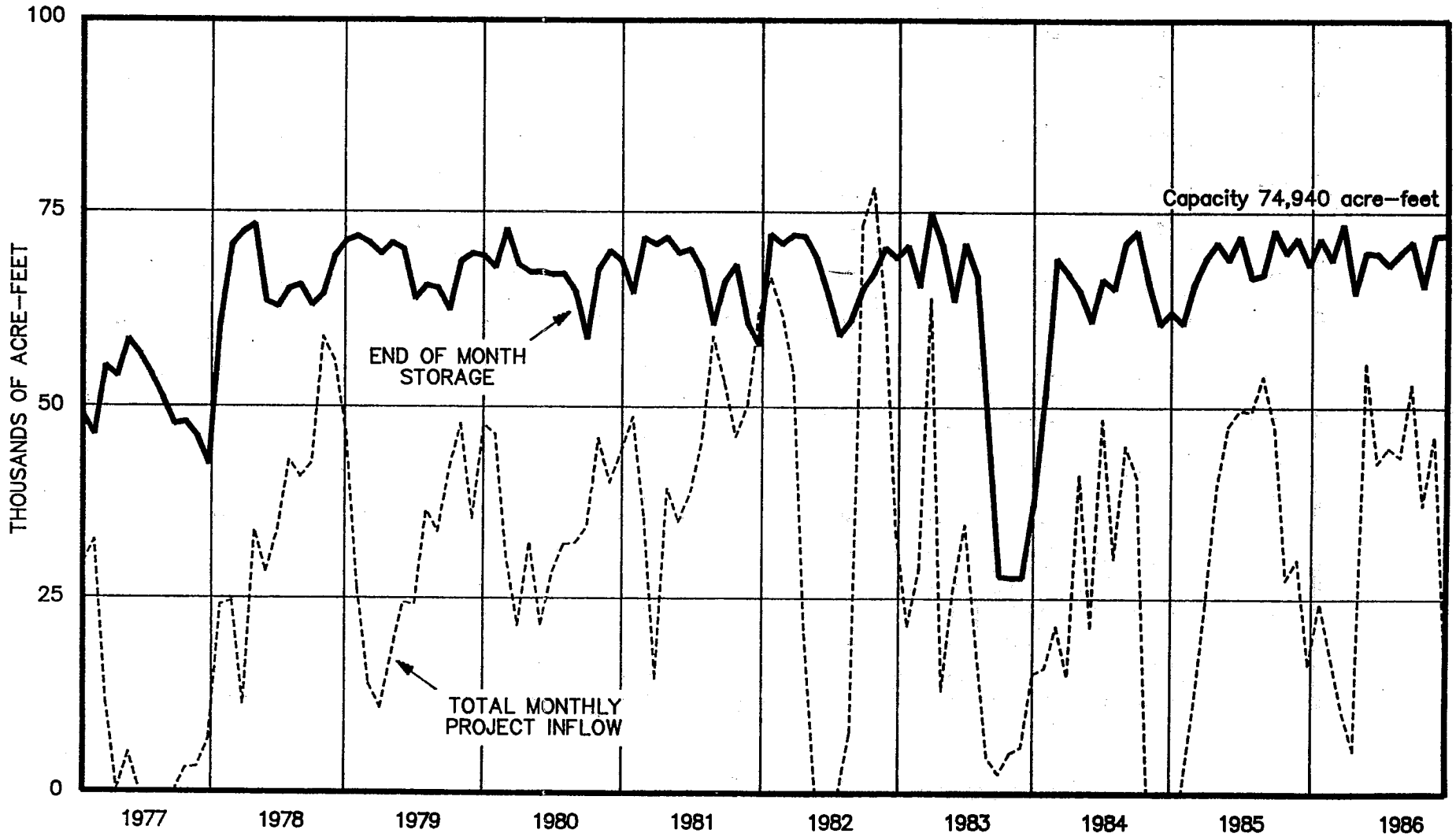
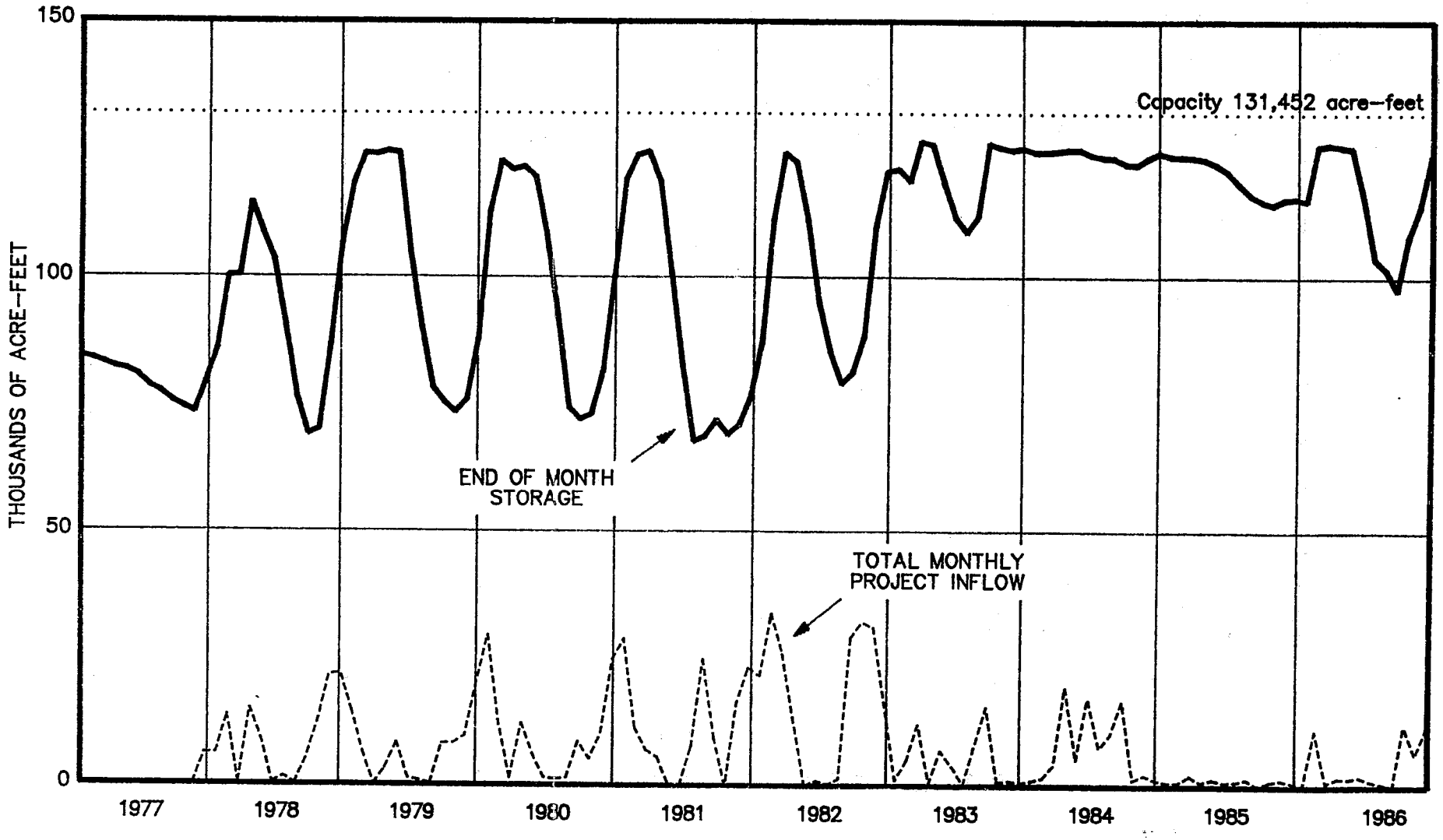


TABLE 18: LAKE PERRIS MONTHLY OPERATION
1986

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet)	TOTAL STORAGE	STORAGE CHANGE	INFLOW	OUTFLOW	COMPUTED LOSSES (-) GAINS (+)
DEC	1,582.97	115,512				
JAN	1,582.74	115,004	-508	267	410	-365
FEB	1,587.46	125,606	10,602	10,952	377	27
MAR	1,587.60	125,926	320	815	459	-36
APR	1,587.43	125,537	-389	1,761	491	-1,659
MAY	1,587.28	125,195	-342	1,729	549	-1,522
JUN	1,583.09	115,778	-9,417	2,058	10,233	-1,242
JUL	1,577.57	103,789	-11,989	1,202	11,883	-1,308
AUG	1,576.54	101,604	-2,185	689	1,541	-1,333
SEP	1,574.61	97,552	-4,052	35	4,188	101
OCT	1,579.56	108,057	10,505	12,007	455	-1,047
NOV	1,582.19	113,792	5,735	6,246	431	-80
DEC	1,586.69	123,851	10,059	11,651	423	-1,169
TOTAL	---	---	8,339	49,412	31,440	-9,633

FIGURE U: LAKE PERRIS OPERATION



APPENDICES

SUMMARY OF AQUEDUCT OPERATIONS

APPENDIX I

TABLE 19: SUMMARY OF GOVERNOR EDMUND
1986

(in acre-feet)

DESCRIPTION	JAN	FEB	MAR	APR	MAY	JUN
DELTA FIELD DIVISION						
	Note: The North Bay Aqueduct, South Bay Aqueduct, and Lake Del Valle					
North Bay Aqueduct						but are shown here
Pumped at Cordelia Interim Pumping Plant	566	378	180	165	270	414
Delivered to Contracting Agencies	576	377	172	169	270	413
Change in Storage	-10	1	8	-4	0	1
Computed Losses (-), Gains (+)	0	0	0	0	0	0
California Aqueduct						
Pumped at Harvey O. Banks Delta Pumping Plant	306,504	112,232	44,645	119,661	184,392	178,455
Pumped at South Bay Pumping Plant	7,483	6,971	3,491	8,439	11,393	13,366
Delivered to Contracting Agencies	8	2	19	514	862	1,371
Outflow at Check 12	299,002	105,804	41,126	110,463	171,422	162,539
Change in Storage	-532	278	-606	854	-809	1,013
Computed Losses (-), Gains (+)	-543	823	-615	609	-1,524	-166
South Bay Aqueduct						
Pumped at South Bay Pumping Plant	7,483	6,971	3,491	8,439	11,393	13,366
Inflow from Lake Del Valle	0	0	3,515	1,428	1,223	467
Outflow (Pumped into Lake Del Valle)	0	0	0	0	0	0
Delivered to Contracting Agencies Project Water Only	6,857	5,465	5,202	7,556	10,947	12,274
Del Valle Natural Inflow Exchanged and Released from Aqueduct	616	1,496	323	873	0	0
Del Valle Natural Inflow Released from Aqueduct	0	0	1,471	1,428	999	352
Del Valle Stored Water Released	0	0	0	0	0	0
Del Valle Stored Exchange and Released from Aqueduct	0	0	0	0	660	1,197
Change in Storage	0	0	0	0	0	0
Computed Losses (-), Gains (+)	-10	-10	-10	-10	-10	-10
Lake Del Valle Operation:						
End-of-Month Storage (State)	25,437	26,867	27,097	27,836	28,066	28,889
Change in Storage	581	1,430	230	739	230	823
SAN LUIS FIELD DIVISION						
O'Neill Forebay Operation						
End-of-Month Storage	48,411	42,660	45,682	52,893	45,027	45,027
Inflow, California Aqueduct	299,002	105,804	41,126	110,463	171,422	162,539
Inflow, O'Neill P.- G. Plant	209,812	200,277	144,526	118,177	103,601	46,973
Inflow, Gianelli P.- G. Plant	0	0	43,026	54,645	61,312	267,688
Delivered to Federal Customers	31	514	700	1,960	2,789	3,699
Delivered to Dept. of Parks and Rec. (State)	0	0	1	0	1	2
Delivered to Dept. of Fish and Game (State)	9	0	6	16	44	55
Outflow, O'Neill P.- G. Plant	0	0	42	0	0	33,669
Outflow, Gianelli P.- G. Plant	272,310	94,870	88,630	63,097	20,596	0
Outflow, Dos Amigos P.P.	227,788	206,950	133,662	205,744	311,525	427,483
Change in Storage	129	-5,751	3,022	7,211	-7,866	0
Computed Losses (-), Gains (+)	-8,447	-9,498	-2,615	-5,257	-9,246	-12,292
San Luis Reservoir Operation						
State End-of-Month Storage	1,065,714	1,075,958	1,061,729	1,060,886	1,044,475	1,004,545
Total End-of-Month Storage	1,868,710	1,974,334	2,024,787	2,025,803	1,977,482	1,704,450
Inflow, Gianelli P.- G. Plant	272,310	94,870	88,630	63,097	20,596	0
Outflow, Gianelli P.- G. Plant	0	0	43,026	54,645	61,312	267,688
Pacheco Tunnel Diversion	0	0	0	0	0	0
Change in Storage	272,751	105,624	50,453	1,016	-48,321	-273,032
Computed Losses (-), Gains (+)	441	10,754	4,849	-7,436	-7,605	-5,344

G. BROWN CALIFORNIA AQUEDUCT OPERATION
1986

(in acre-feet)

JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	DESCRIPTION
							DELTA FIELD DIVISION
are not within the Edmond G. Brown California Aqueduct, for simplicity.							
							North Bay Aqueduct
432	397	274	172	105	170	3,523	Pumped at Cordelia Interim Pumping Plant
431	393	276	171	105	170	3,523	Delivered to Contracting Agencies
1	4	-2	1	0	0	0	Change in Storage
0	0	0	0	0	0	0	Computed Losses (-), Gains (+)
							California Aqueduct
							Pumped at Harvey O. Banks Delta
239,823	330,595	374,808	207,921	180,820	188,133	2,467,989	Pumping Plant
15,848	16,055	9,522	6,208	4,961	10,325	114,062	Pumped at South Bay Pumping Plant
1,227	918	426	345	97	28	5,817	Delivered to Contracting Agencies
220,987	312,525	364,300	201,568	175,691	177,828	2,343,255	Outflow at Check 12
-659	706	-267	-244	46	151	-69	Change in Storage
-2,420	-391	-827	-44	-25	199	-4,924	Computed Losses (-), Gains (+)
							South Bay Aqueduct
15,848	16,055	9,522	6,208	4,961	10,325	114,062	Pumped at South Bay Pumping Plant
23	0	4,631	4,078	4,675	1,281	21,321	Inflow from Lake Del Valle
0	0	0	0	0	0	0	Outflow (Pumped into Lake Del Valle)
							Delivered to Contracting Agencies
11,791	11,922	11,213	9,450	9,467	11,439	113,583	Project Water Only
							Del Valle Natural Inflow Exchanged and
83	70	0	0	0	0	3,461	Released from Aqueduct
							Del Valle Natural Inflow Released
23	0	55	118	129	157	4,732	from Aqueduct
0	0	0	0	0	0	0	Del Valle Stored Water Released
							Del Valle Stored Exchange and Released
3,964	4,053	2,875	708	0	0	13,457	from Aqueduct
0	0	0	0	0	0	0	Change in Storage
-10	-10	-10	-10	-40	-10	-150	Computed Losses (-), Gains (+)
							Lake Del Valle Operation:
32,596	36,372	34,398	30,931	26,223	25,050	---	End-of-Month Storage (State)
3,707	3,776	-1,974	-3,467	-4,708	-1,173	194	Change in Storage
							SAN LUIS FIELD DIVISION
							O'Neill Forebay Operation
47,441	48,176	47,283	48,176	47,809	51,901	---	End-of-Month Storage
220,987	312,525	364,300	201,568	175,691	177,828	2,343,255	Inflow, California Aqueduct
3,359	25,728	107,628	124,208	163,002	227,171	1,474,462	Inflow, O'Neill P.- G. Plant
307,062	152,895	2,968	0	0	0	889,596	Inflow, Gianelli P.- G. Plant
4,410	5,333	1,675	412	155	170	21,948	Delivered to Federal Customers
2	1	2	0	1	0	10	Delivered to Dept. of Parks and Rec. (State)
44	70	34	5	8	8	299	Delivered to Dept. of Fish and Game (State)
6,111	1,271	0	0	0	0	41,093	Outflow, O'Neill P.- G. Plant
0	19,297	247,457	157,851	133,989	168,155	1,266,252	Outflow, Gianelli P.- G. Plant
509,572	459,965	223,922	165,816	203,298	224,447	3,300,172	Outflow, Dos Amigos P.P.
2,414	735	-893	893	-367	4,092	3,619	Change in Storage
-8,855	-4,476	-2,699	-799	-1,609	-8,127	-73,920	Computed Losses (-), Gains (+)
							San Luis Reservoir Operation
859,195	828,179	993,209	1,060,969	1,056,544	1,062,590	---	State End-of-Month Storage
1,389,871	1,248,961	1,481,259	1,628,001	1,753,022	1,916,471	---	Total End-of-Month Storage
0	19,297	247,457	157,851	133,989	168,155	1,266,252	Inflow, Gianelli P.- G. Plant
307,062	152,895	2,968	0	0	0	889,596	Outflow, Gianelli P.- G. Plant
0	0	0	0	77	0	77	Pacheco Tunnel Diversion
-314,579	-140,910	232,298	146,742	125,021	163,449	320,512	Change in Storage
-7,517	-7,312	-12,191	-11,109	-8,891	-4,706	-56,067	Computed Losses (-), Gains (+)

TABLE 19: SUMMARY OF GOVERNOR EDMUND
1986

(in acre-feet)

DESCRIPTION	JAN	FEB	MAR	APR	MAY	JUN
SAN LUIS FIELD DIVISION (Cont.)						
California Aqueduct (Pools 14 thru 21)						
Inflow, Dos Amigos P.P.(State)	118,945	102,786	59,174	100,996	179,957	203,303
Inflow, Dos Amigos P.P.(Federal)	108,843	104,164	74,488	104,748	131,568	224,180
Inflow, Floodwater	0	3,547	5,292	2,584	0	3,191
Delivered to Dept. of Fish and Game (State)	17	12	7	23	10	3
Delivered to Federal Customers	97,634	109,849	77,530	114,039	136,049	231,571
Outflow, Check 21 (State)	120,337	110,776	62,820	105,930	186,113	207,075
Outflow, Check 21 (Federal)	13,000	0	0	0	0	0
Change in Storage	800	-1,026	79	895	-668	1,365
Computed Losses (-), Gains (+)	4,000	9,114	1,482	12,559	9,979	9,340
SAN JOAQUIN FIELD DIVISION						
California Aqueduct, Check 21 to Buena Vista Pumping Plant						
Inflow, Check 21 (state)	120,337	110,776	62,820	105,930	186,113	207,075
Inflow, Check 21 (Federal)	13,000	0	0	0	0	0
Inflow, Kern River Intertie (State)	0	0	11,275	4,305	0	1,867
Delivered to Contracting State Agencies	33,086	44,825	28,932	35,607	47,279	80,655
Delivered to Federal Customers	13,000	0	0	0	0	0
Delivered for Repayment of Pre-consolidation Water	0	0	0	0	0	0
Outflow, Buena Vista P.P.	77,304	57,538	35,750	50,215	113,552	99,345
Coastal Br. Diversion	7,388	5,358	8,412	15,264	20,414	25,146
Change in Storage	-277	205	-44	90	-77	-105
Computed Losses (-), Gains (+)	-2,836	-2,850	-1,045	-9,059	-4,945	-3,901
California Aqueduct, Buena Vista P.P. to Wheeler Ridge P.P.						
Inflow, Buena Vista P.P.	77,304	57,538	35,750	50,215	113,552	99,345
Delivered to Contracting State Agencies	4,101	6,705	15,779	9,764	11,580	23,539
Outflow, Wheeler Ridge P.P.	74,094	51,837	19,903	40,555	100,814	75,475
Change in Storage	162	-212	221	114	-294	164
Computed Losses (-), Gains (+)	1,053	792	153	218	-1,452	-167
California Aqueduct, Wheeler Ridge to Ira J. Chrisman Wind Gap P.P.						
Inflow, Wheeler Ridge P.P.	74,094	51,837	19,903	40,555	100,814	75,475
Delivered to Contracting State Agencies	837	1,359	1,999	4,011	6,000	8,108
Outflow, Ira J. Chrisman Wind Gap P.P.	72,986	50,281	17,110	36,228	96,184	67,384
Change in Storage	2	-56	41	27	0	-113
Computed Losses (-), Gains (+)	-269	-253	-753	-289	1,370	-96
California Aqueduct, Ira J. Chrisman Wind Gap P.P. to A.D. Edmunston P.P.						
Inflow, Ira J. Chrisman Wind Gap P.P.	72,986	50,281	17,110	36,228	96,184	67,384
Delivered to Contracting State Agencies	319	246	935	1,101	2,307	2,652
Outflow, A.D. Edmunston P.P.	71,540	49,293	16,236	34,838	95,132	64,989
Change in Storage	-13	47	-57	-35	-21	5
Computed Losses (-), Gains (+)	-1,140	-695	4	-324	1,234	262
Coastal Branch, California Aqueduct						
Inflow, Las Perillas P.P.	7,388	5,358	8,412	15,264	20,414	25,146
Delivered to Contracting State Agencies	7,115	5,332	7,947	14,544	19,308	22,986
Delivered to Federal Customers	0	0	0	0	0	0
Change in Storage	-2	-1	-2	5	5	-4
Computed Losses (-), Gains (+)	-275	-27	-467	-715	-1,101	-2,164

G. BROWN CALIFORNIA AQUEDUCT OPERATION
1986

(in acre-feet)

JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	DESCRIPTION
							SAN LUIS FIELD DIVISION (Cont.)
							California Aqueduct (Pools 14 thru 21)
276,705	281,343	182,268	128,218	169,296	169,595	1,972,586	Inflow, Dos Amigos P.P.(State)
232,867	178,622	41,654	37,598	34,002	54,852	1,327,586	Inflow, Dos Amigos P.P.(Federal)
0	0	0	0	0	0	14,614	Inflow, Floodwater
0	0	22	19	20	8	141	Delivered to Dept. of Fish and Game (State)
241,258	181,324	42,506	34,474	35,436	55,821	1,357,491	Delivered to Federal Customers
288,198	284,339	183,910	128,482	171,276	170,908	2,020,164	Outflow, Check 21 (State)
0	0	773	3,227	0	0	17,000	Outflow, Check 21 (Federal)
-1,188	319	372	-161	-158	-118	511	Change in Storage
18,696	6,017	3,661	225	3,276	2,172	80,521	Computed Losses (-), Gains (+)
							SAN JOAQUIN FIELD DIVISION
							California Aqueduct, Check 21 to Buena Vista Pumping Plant
288,198	284,339	183,910	128,482	171,276	170,908	2,020,164	Inflow, Check 21 (state)
0	0	773	3,227	0	0	17,000	Inflow, Check 21 (Federal)
0	0	0	0	0	0	17,447	Inflow, Kern River Intertie (State)
140,050	132,675	43,983	38,806	65,289	77,861	769,048	Delivered to Contracting State Agencies
0	0	773	3,227	0	0	17,000	Delivered to Federal Customers
0	797	806	0	0	0	1,603	Delivered for Repayment of Pre-consolidation Water
116,854	130,316	127,110	81,129	101,561	86,636	1,077,310	Outflow, Buena Vista P.P.
26,756	17,509	9,568	5,756	790	1,977	144,338	Coastal Br. Diversion
-152	-139	133	-115	-81	131	-431	Change in Storage
-4,690	-3,181	-2,310	-2,906	-3,717	-4,303	-45,743	Computed Losses (-), Gains (+)
							California Aqueduct, Buena Vista P.P. to Wheeler Ridge P.P.
116,854	130,316	127,110	81,129	101,561	86,636	1,077,310	Inflow, Buena Vista P.P.
25,092	24,107	5,319	3,167	1,282	1,559	131,994	Delivered to Contracting State Agencies
92,026	107,046	122,306	77,999	100,200	85,087	947,342	Outflow, Wheeler Ridge P.P.
-70	62	279	-117	47	-168	188	Change in Storage
194	899	794	-80	-32	-158	2,214	Computed Losses (-), Gains (+)
							California Aqueduct, Wheeler Ridge to Ira J. Chrisman Wind Gap P.P.
92,026	107,046	122,306	77,999	100,200	85,087	947,342	Inflow, Wheeler Ridge P.P.
7,609	3,611	2,378	1,963	2,122	2,464	42,461	Delivered to Contracting State Agencies
85,088	102,720	119,995	77,389	98,992	83,202	907,559	Outflow, Ira J. Chrisman Wind Gap P.P.
-23	-21	33	3	-23	-36	-166	Change in Storage
648	-736	100	1,356	891	543	2,512	Computed Losses (-), Gains (+)
							California Aqueduct, Ira J. Chrisman Wind Gap P.P. to A.D. Edmunston P.P.
85,088	102,720	119,995	77,389	98,992	83,202	907,559	Inflow, Ira J. Chrisman Wind Gap P.P.
3,144	2,566	1,723	549	653	577	16,772	Delivered to Contracting State Agencies
81,236	99,467	117,172	76,422	97,526	82,403	886,254	Outflow, A.D. Edmunston P.P.
-33	32	12	147	-65	80	99	Change in Storage
-741	-655	-1,088	-271	-878	-142	-4,434	Computed Losses (-), Gains (+)
							Coastal Branch, California Aqueduct
26,756	17,509	9,568	5,756	790	1,977	144,338	Inflow, Las Perillas P.P.
24,442	16,655	9,514	5,482	690	1,711	135,726	Delivered to Contracting State Agencies
40	10	0	0	0	0	50	Delivered to Federal Customers
4	-9	10	-16	-2	1	-11	Change in Storage
-2,270	-853	-44	-290	-102	-265	-8,573	Computed Losses (-), Gains (+)

TABLE 19: SUMMARY OF GOVERNOR EDMUND
1986

(in acre-feet)

DESCRIPTION	JAN	FEB	MAR	APR	MAY	JUN
SOUTHERN FIELD DIVISION						
California Aqueduct, A.D. Edmonston P.P. to Junction of West Branch						
Inflow, A.D. Edmonston P.P.	71,540	49,293	16,236	34,838	95,132	64,989
Outflow, West Branch	46,803	31,329	2,930	23,543	29,816	13,507
Outflow, East Branch	24,757	17,980	13,291	11,315	65,328	51,493
Change in Storage	4	-1	17	-18	10	-7
Computed Losses (-), Gains (+)	24	15	2	2	22	4
California Aqueduct, Junction of West Branch to Pearblossom P.P.						
Inflow (Aqueduct)	24,757	17,980	13,291	11,315	65,328	51,493
Delivered to Contracting Agencies	1,056	738	1,507	3,701	4,501	4,986
Outflow, Pearblossom P.P.	25,364	18,505	11,927	7,579	62,343	46,935
Change in Storage	93	-175	-36	206	118	-169
Computed Losses (-), Gains (+)	1,756	1,088	107	171	1,634	259
California Aqueduct, Pearblossom P.P. to Silverwood Lake						
Inflow, Pearblossom P.P.	25,364	18,505	11,927	7,579	62,343	46,935
Deliveries (Exchange of Natural Inflow)	211	204	776	1,076	1,092	781
Outflow to Silverwood Lake	24,587	17,417	10,515	5,650	55,636	42,869
Change in Storage	68	28	-220	218	34	-69
Computed Losses (-), Gains (+)	-498	-856	-856	-635	-5,581	-3,354
Silverwood Lake Operation						
Inflow, Project	24,587	17,417	10,515	5,650	55,636	42,869
Inflow, Natural	607	4,804	4,442	2,032	653	147
Delivered to Contracting Agencies	129	103	68	85	153	169
Outflow, Natural Inflow Released	14	3,490	2,357	1,275	583	13
Outflow, Project Water at San Bernardino Tunnel	21,661	22,466	8,464	14,955	52,164	44,205
Change in storage	3,365	-2,695	4,498	-8,771	5,190	-94
Computed Losses (-), Gains (+)	-25	1,143	430	-138	1,801	1,277
California Aqueduct, Silverwood Lake to Lake Perris						
Inflow, San Bernardino Tunnel	21,661	22,466	8,464	14,955	52,164	44,205
Delivered to Contracting Agencies	21,396	11,514	7,649	13,193	50,438	42,143
Outflow to Lake Perris	267	10,952	815	1,761	1,729	2,058
Change in Storage	-3	-1	-1	-1	-5	1
Operational Losses (-), Gains (+)	-1	-1	-1	-2	-2	-3
Lake Perris Operation						
Inflow	267	10,952	815	1,761	1,729	2,058
Delivered to Contracting Agencies	410	377	459	491	549	10,233
Outflow	0	0	0	0	0	0
Change in Storage	-508	10,602	320	-389	-342	-9,417
Computed Losses (-), Gains (+)	-365	27	-36	-1,659	-1,522	-1,242

G. BROWN CALIFORNIA AQUEDUCT OPERATION
1986

(in acre-feet)

JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	DESCRIPTION
							SOUTHERN FIELD DIVISION
							California Aqueduct, A.D. Edmonston P.P. to Junction of West Branch
81,236	99,467	117,172	76,422	97,526	82,403	886,254	Inflow, A.D. Edmonston P.P.
28,720	47,741	58,365	34,417	48,118	62,538	427,827	Outflow, West Branch
52,530	51,765	58,838	42,033	49,440	19,857	458,627	Outflow, East Branch
14	-13	-1	1	-2	19	23	Change in Storage
28	26	30	29	30	11	223	Computed Losses (-), Gains (+)
							California Aqueduct, Junction of West Branch to Pearblossom P.P.
52,530	51,765	58,838	42,033	49,440	19,857	458,627	Inflow (Aqueduct)
5,336	5,203	3,500	2,516	1,502	1,162	35,708	Delivered to Contracting Agencies
49,464	48,310	57,533	41,740	50,071	19,289	439,060	Outflow, Pearblossom P.P.
-156	145	34	-58	101	202	305	Change in Storage
2,114	1,893	2,229	2,165	2,234	796	16,446	Computed Losses (-), Gains (+)
							California Aqueduct, Pearblossom P.P. to Silverwood Lake
49,464	48,310	57,533	41,740	50,071	19,289	439,060	Inflow, Pearblossom P.P.
481	280	280	131	62	127	5,501	Deliveries (Exchange of Natural Inflow)
44,803	43,644	52,980	37,270	46,390	18,050	399,811	Outflow to Silverwood Lake
-86	170	-70	-296	277	44	98	Change in Storage
-4,266	-4,216	-4,343	-4,635	-3,342	-1,068	-33,650	Computed Losses (-), Gains (+)
							Silverwood Lake Operation
44,803	43,644	52,980	37,270	46,390	18,050	399,811	Inflow, Project
4	0	14	65	88	198	13,054	Inflow, Natural
202	222	171	120	111	100	1,633	Delivered to Contracting Agencies
13	15	13	15	13	14	7,815	Outflow, Natural Inflow Released
46,584	43,107	53,000	46,151	40,677	18,419	411,853	Outflow, Project Water at San Bernardino Tunnel
-1,493	1,606	1,398	-5,738	6,481	172	3,919	Change in storage
499	1,306	1,588	3,213	804	457	12,355	Computed Losses (-), Gains (+)
							California Aqueduct, Silverwood Lake to Lake Perris
46,584	43,107	53,000	46,151	40,677	18,419	411,853	Inflow, San Bernardino Tunnel
45,380	42,415	52,969	34,132	34,436	6,763	362,428	Delivered to Contracting Agencies
1,202	689	35	12,007	6,246	11,651	49,412	Outflow to Lake Perris
-1	0	-7	10	-6	4	-10	Change in Storage
-3	-3	-3	-2	-1	-1	-23	Operational Losses (-), Gains (+)
							Lake Perris Operation
1,202	689	35	12,007	6,246	11,651	49,412	Inflow
11,883	1,541	4,188	455	431	423	31,440	Delivered to Contracting Agencies
0	0	0	0	0	0	0	Outflow
-11,989	-2,185	-4,052	10,505	5,735	10,059	8,339	Change in Storage
-1,308	-1,333	101	-1,047	-80	-1,169	-9,633	Computed Losses (-), Gains (+)

TABLE 19: SUMMARY OF GOVERNOR EDMUND
1986

(in acre-feet)

DESCRIPTION	JAN	FEB	MAR	APR	MAY	JUN
SOUTHERN FIELD DIVISION (Cont.)						
West Branch California Aqueduct Tehachapi Afterbay to Oso P.P.						
Inflow	46,803	31,329	2,930	23,543	29,816	13,507
Outflow, Oso Pumping Plant	46,863	31,376	2,884	23,606	29,854	13,540
Change in Storage	12	-2	50	-56	30	-22
Computed Losses (-), Gains (+)	72	45	4	7	68	11
West Branch California Aqueduct Oso P.P. to Pyramid Lake						
Inflow, Oso P.P.	46,863	31,376	2,884	23,606	29,854	13,540
Outflow through William E. Warne Powerplant into Pyramid Lake	45,176	31,305	1,457	25,088	28,742	14,590
Change in Storage	1,680	56	1,294	-1,445	1,095	-1,044
Operational Losses (-), Gains (+)	-7	-15	-133	37	-17	6
Pyramid Lake Operation						
Inflow, Project	45,176	31,305	1,457	25,088	28,742	14,590
Inflow, Natural	3,222	13,777	5,750	3,118	1,096	418
Inflow, Pumpback from Elderberry Forebay	0	0	12,334	10,319	61,919	68,857
Delivered to Dept. of Parks and Rec. (State)	0	2	0	1	2	0
Outflow, Pyramid Diversion	1,925	13,126	3,922	4,288	2,268	764
Outflow, Angeles Tunnel	44,668	25,602	12,014	37,886	84,881	80,071
Change in Storage	-608	5,007	2,734	-5,387	977	-201
Computed Losses (-), Gains (+)	-2,413	-1,345	-871	-1,737	-3,629	-3,231
Elderberry Forebay Operation						
Inflow, Project through Castaic P-G Plant	44,668	25,602	12,014	37,886	84,881	80,071
Inflow, Natural	643	4,532	2,520	728	157	11
Outflow, Pumpback to Pyramid Lake	0	0	12,334	10,319	61,919	68,857
Outflow, Project Water Released to Castaic Lake	47,243	25,930	1,287	26,697	23,367	15,720
Change in Storage	-1,837	-2,173	1,198	1,753	1,255	-3,227
Computed Losses (-), Gains (+)	95	-6,377	285	155	1,503	1,268
Castaic Lake Operation						
Inflow, Project	47,243	25,930	1,287	26,697	23,367	15,720
Inflow, Natural	579	4,973	4,118	1,103	382	136
Delivered to Contracting Agencies	27,015	7,924	8,143	31,055	46,176	37,380
Outflow, Castaic ~~Afterbay~~ Lagoon	1,481	439	382	1,371	915	241
Change in Storage	21,100	29,532	-2,995	-5,044	-22,103	-21,918
Computed Losses (-), Gains (+)	1,774	6,992	125	-418	1,239	-153
Castaic Lagoon Operation						
Inflow	1,481	439	382	1,371	915	241
Outflow	1,387	450	219	1,268	990	163
Change in Storage	18	-95	69	32	-171	-39
Operational Losses (-), Gains (+)	-76	-84	-94	-71	-96	-117

G. BROWN CALIFORNIA AQUEDUCT OPERATION
1986

(in acre-feet)

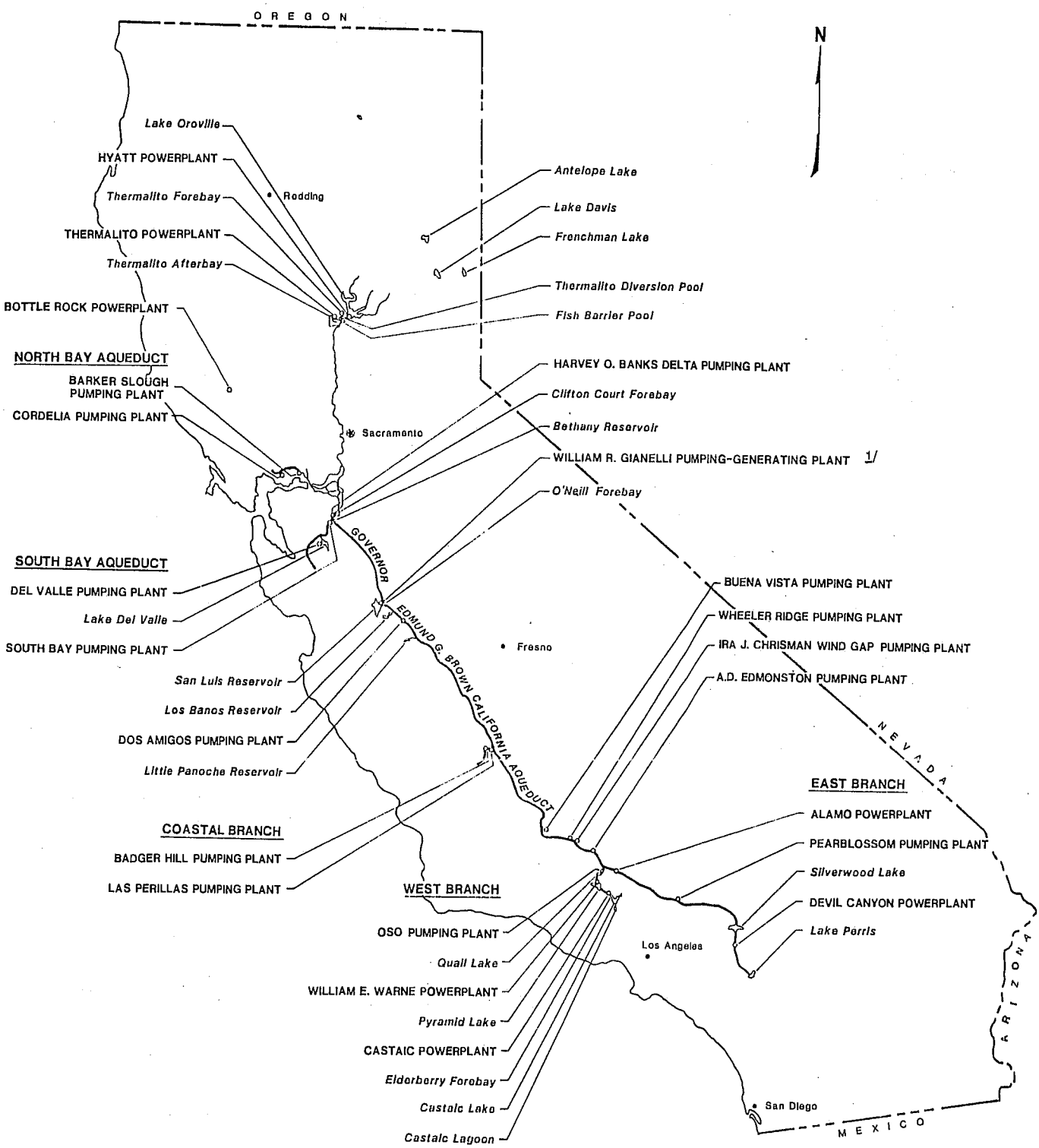
JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	DESCRIPTION
							SOUTHERN FIELD DIVISION (Cont.)
							West Branch California Aqueduct Tehachapi Afterbay to Oso P.P.
28,720	47,741	58,365	34,417	48,118	62,538	427,827	Inflow
28,764	47,858	58,460	34,502	48,217	62,514	428,438	Outflow, Oso Pumping Plant
43	-39	-3	5	-6	57	69	Change in Storage
87	78	92	90	93	33	680	Computed Losses (-), Gains (+)
							West Branch California Aqueduct Oso P.P. to Pyramid Lake
28,764	47,858	58,460	34,502	48,217	62,514	428,438	Inflow, Oso P.P.
26,541	49,985	59,058	33,354	48,307	63,416	427,019	Outflow through William E. Warne Powerplant into Pyramid Lake
1,154	-1,108	152	102	203	188	2,327	Change in Storage
-1,069	1,019	750	-1,046	293	1,090	908	Operational Losses (-), Gains (+)
							Pyramid Lake Operation
26,541	49,985	59,058	33,354	48,307	63,416	427,019	Inflow, Project
272	241	324	390	617	574	29,799	Inflow, Natural
5,465	2,084	1,916	43	75	752	163,764	Inflow, Pumpback from Elderberry Forebay
5	5	0	0	4	1	20	Delivered to Dept. of Parks and Rec. (State)
752	912	673	653	500	450	30,233	Outflow, Pyramid Diversion
30,951	43,036	56,906	32,989	43,961	65,148	558,113	Outflow, Angeles Tunnel
-2,024	5,933	242	-2,147	2,083	-2,841	3,768	Change in Storage
-2,594	-2,424	-3,477	-2,292	-2,451	-1,984	-28,448	Computed Losses (-), Gains (+)
							Elderberry Forebay Operation
30,951	43,036	56,906	32,989	43,961	65,148	558,113	Inflow, Project through Castaic P-G Plant
0	0	0	0	5	13	8,609	Inflow, Natural
5,465	2,084	1,916	43	75	752	163,764	Outflow, Pumpback to Pyramid Lake
24,675	43,416	55,987	31,287	46,188	66,132	407,929	Outflow, Project Water Released to Castaic Lake
1,184	-2,445	-527	1,697	-2,258	-1,425	-6,805	Change in Storage
373	19	470	38	39	298	-1,834	Computed Losses (-), Gains (+)
							Castaic Lake Operation
24,675	43,416	55,987	31,287	46,188	66,132	407,929	Inflow, Project
38	9	42	72	96	119	11,667	Inflow, Natural
48,905	49,079	40,427	31,309	33,765	32,422	393,600	Delivered to Contracting Agencies
353	307	269	100	299	101	6,258	Outflow, Castaic ~~Afterbay~~ Lagoon
-23,612	-5,432	15,593	-800	11,746	32,638	28,705	Change in Storage
933	529	260	-750	-474	-1,090	8,967	Computed Losses (-), Gains (+)
							Castaic Lagoon Operation
353	307	269	100	299	101	6,258	Inflow
112	9	42	72	101	132	4,945	Outflow
60	-2	-56	-142	31	-85	-380	Change in Storage
-181	-300	-283	-170	-167	-54	-1,693	Operational Losses (-), Gains (+)

PUMPING PLANTS

APPENDIX II


POWERPLANT

MAP 2
PROJECT FACILITIES



1/ William R. Gianelli Pumping-Generating Plant, previously known as San Luis Pumping-Generating Plant, will be the name designating this facility throughout this report.

TABLE 20: PROJECT PUMPING PLANTS

1986

(in acre-feet)

PUMPING PLANTS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
Hyatt	0	1,059	0	31,367	45,693	12,093	22,570	29,757	17,081	5,225	7,347	7,271	179,463
Thermalito	0	1,018	0	43,828	53,011	11,646	20,620	29,944	14,176	5,119	7,512	8,068	194,942
Cordelia	566	378	180	165	270	414	432	397	274	172	105	170	3,523
South Bay	7,483	6,971	3,491	8,439	11,393	13,366	15,848	16,055	9,522	6,208	4,961	10,425	114,162
Del Valle	0	0	0	0	0	0	0	0	0	0	0	0	0
Banks													
State	290,244	112,232	44,645	119,661	184,392	178,455	168,381	278,471	374,808	207,921	180,820	188,133	2,328,163
Federal	16,260	0	0	0	0	0	71,442	52,124	0	0	0	0	139,826
San Luis 1/													
State	158,712	4,329	863	3,556	15,158	0	0	19,297	171,874	73,870	507	8,634	456,800
Federal	113,598	90,541	87,767	59,541	5,438	0	0	0	75,583	83,981	133,482	159,521	809,452
O'Neill 2/													
State	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal	209,812	200,277	144,526	118,177	103,601	46,973	3,359	25,728	107,628	124,208	163,002	227,171	1,474,462
Dos Amigos 1/													
State	118,945	102,786	59,174	100,996	179,957	203,303	276,705	281,343	182,268	128,218	169,296	169,595	1,972,586
Federal	108,843	104,164	74,488	104,748	131,568	224,180	232,867	178,622	41,654	37,598	34,002	54,852	1,327,586
Las Perillas	7,388	5,358	8,412	15,264	20,414	25,146	26,756	17,509	9,568	5,756	790	1,977	144,338
Badger Hill	7,388	5,358	8,412	15,264	20,414	25,146	26,704	17,519	9,568	5,756	790	1,988	144,307
Buena Vista	77,304	57,538	35,750	50,215	113,552	99,345	116,854	130,316	127,110	81,129	101,561	86,636	1,077,310
Wheeler Ridge	74,094	51,837	19,903	40,555	100,814	75,475	92,026	107,046	122,306	77,999	100,200	85,057	947,312
Ira J. Chrisman Wind Gap	72,986	50,281	17,110	36,228	96,184	67,364	85,088	102,711	119,995	77,389	98,992	83,197	907,525
A.D. Edmonston	71,540	49,293	16,236	34,838	95,132	64,989	81,236	99,467	117,172	76,422	97,522	82,403	886,250
Oso	46,863	31,376	2,884	23,606	29,854	13,540	28,764	47,858	58,460	34,502	48,217	62,514	428,438
Castaic	0	0	12,334	10,319	61,919	68,857	5,465	2,084	1,916	43	75	752	163,764
Pearblossom	25,364	18,505	11,927	7,579	62,343	46,935	49,464	48,310	57,533	41,740	50,071	19,289	439,060

1/ Joint State-Federal Facility.
2/ O'Neill Pumping Plant is a Federal facility.

Total State:	10,387,943
Total Federal:	3,751,326
Total Project:	14,139,269

WATER QUALITY

APPENDIX III

MAP 4
WATER QUALITY MONITORING STATIONS

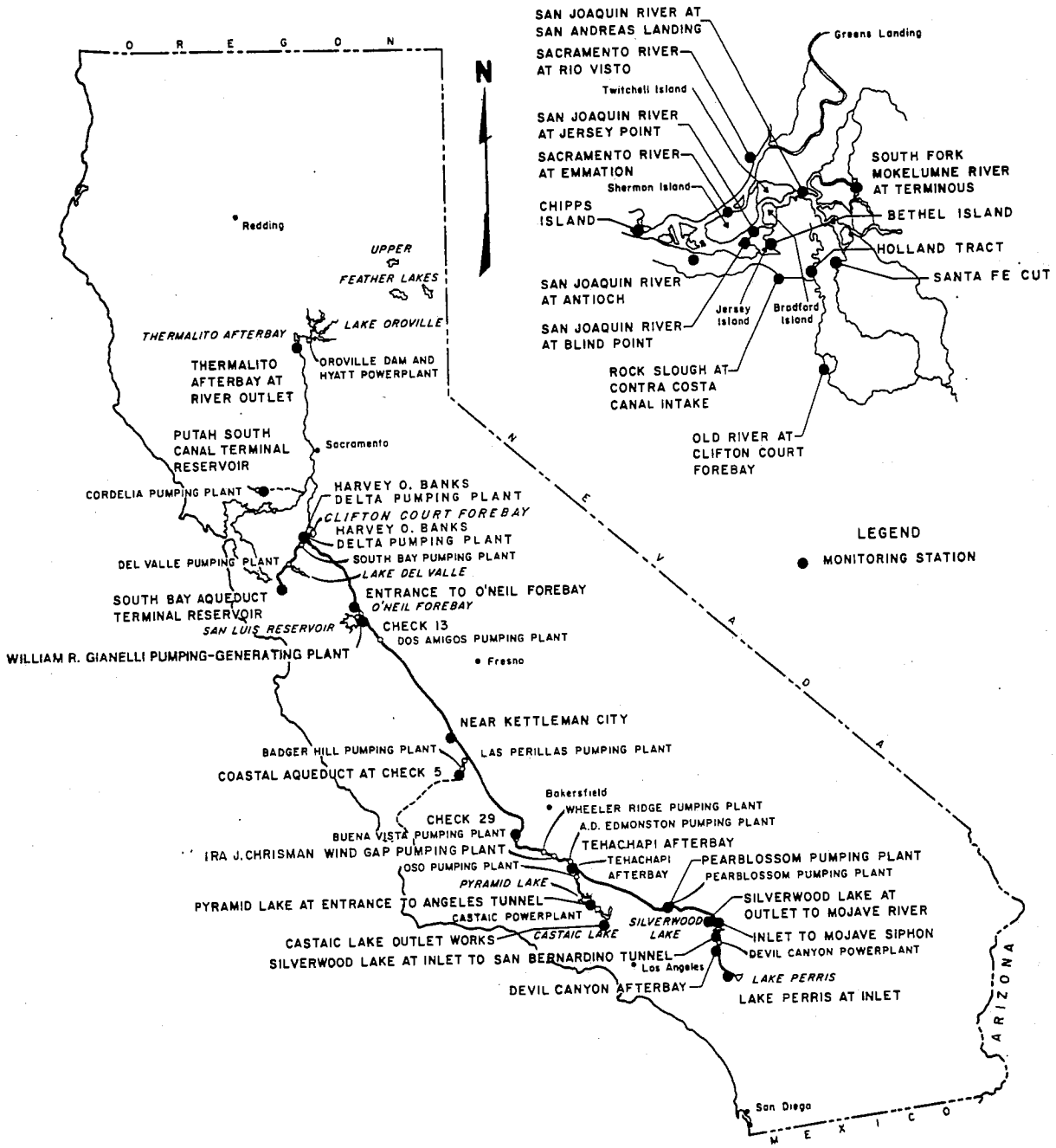


TABLE 21: THERMALITO AFTERBAY AT FEATHER RIVER OUTLET
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	66		50	60	55	51	50	52	49	54	55	64	55
Total Hardness	39		28	30	30	30	32	32	30	36	36	36	33
Chlorides	1		1	1	1	1	1	2	1	1	1	1	1
Sulfates	2		5	3	1	0	2	3	2	3	3	2	2
Sodium	4		2	3	3	3	3	3	3	4	4	4	3
% Sodium	18		14	18	17	18	17	17	18	19	19	18	18
Electrical Conductivity	91		66	66	71	72	76	76	72	75	80	83	75
pH	7.8		7.6	7.7	7.6	7.8	7.8	7.8	7.9	7.1	8.6	8.3	8.0
Boron	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fluoride													
Lead													
Selenium													
Hexavalent Chromium													
Arsenic													
Iron													
Manganese													
Magnesium	4		3	3	3	3	3	3	3	4	4	4	3
Copper													
Calcium	9		6	7	7	7	8	8	7	8	8	8	8
Zinc													
Phenol													
Color (units)													
Sampling Date	01/15	02/19	03/19	04/16	05/21	06/18	07/16	08/20	09/17	10/15	11/19	12/17	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % so and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 22: INFLOW TO NORTH BAY AQUEDUCT
(AT CORDELIA INTERIM PLANT ON PUTAH SOUTH CANAL)
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	208		178	196	186	170	164	148	163	167	173	173	175
Total Hardness	165		148	163	147	147	151	130	141	147	143	150	148
Chlorides	8		7	7	6	5	6	8	6	5	5	6	6
Sulfates	26		23	26	23	22	20	20	20	19	19	18	21
Sodium	13		12	12	10	10	10	8	10	9	10	10	10
% Sodium	15		15	14	13	13	13	12	14	12	13	13	13
Electrical Conductivity	360		314	339	322	302	296	293	296	295	295	300	310
pH	8.3		8.2	8.3	8.2	8.5	8.6	8.6	8.6	8.6	8.4	8.6	8.5
Boron	0.2		0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Fluoride													
Lead													
Selenium													
Hexavalent Chromium													
Arsenic													
Iron													
Manganese													
Magnesium	28		25	28	26	26	27	23	25	26	25	26	26
Copper													
Calcium	20		18	19	16	16	16	14	15	16	16	17	17
Zinc													
Phenol													
Color (units)													
Sampling Date	01/14	02/18	03/18	04/15	05/20	06/17	07/15	08/19	09/16	10/14	11/18	12/16	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 23: CALIFORNIA AQUEDUCT AT HARVEY O. BANKS DELTA PUMPING PLANT 1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	276	251	191	153	173	181	171	171	178	157	143	165	184
Total Hardness**	104	99	75	63	70	72	69	69	71	65	60	67	74
Chlorides**	74	63	39	27	33	36	33	33	35	29	25	31	38
Sulfates**	45	40	31	26	29	30	29	29	30	27	25	28	31
Sodium**	52	46	32	24	29	30	28	28	29	25	22	27	31
% Sodium**	52	50	48	45	47	48	47	47	47	46	45	46	47
Electrical Conductivity***	474	431	322	255	292	306	288	288	300	263	238	277	311
Electrical Conductivity	522	454	319	228	296		266	310	312	258	234	276	314
pH	7.6	7.9	7.7	7.9	7.6	8.1	7.8	7.8	8.0	8.0	7.9	7.8	7.8
Boron	0.1	0.2	0.3	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.2
Fluoride	0.1	0.0	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.00
Iron	0.05	0.03	0.03	0.03	0.02	0.01	0.01	0.05	0.85	0.01	0.03	0.02	0.10
Manganese	0.02	0.02	0.01	0.02	0.03	0.01	0.02	0.03	0.05	0.01	0.02	0.02	0.02
Magnesium	14	13	8	6	8	8	8	10	10	9	8	10	9
Copper	0.01	0.01	0.02	0.00	0.00	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01
Calcium	20	23	16	12	15	16	14	16	15	14	14	16	16
Zinc	0.02	0.01	0.02	0.00	0.00	0.01	0.01	0.04	0.02	0.02	0.02	0.02	0.02
Phenol		0.004							0.009				0.007
Color (units)	20	25	30	25	25	20	10	15	15	20	10	5	18
Sampling Date	01/15	02/19	03/19	04/16	05/21	06/18	07/16	08/20	09/17	10/15	11/19	12/17	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 24:SOUTH BAY AQUEDUCT TERMINAL RESERVOIR
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	280	248	176	147	165	169	159	158	187	178	179	155	184
Total Hardness**	128	115	85	74	81	82	79	78	89	86	86	77	88
Chlorides**	60	51	25	12	20	22	18	17	29	26	26	16	27
Sulfates**	47	41	31	28	30	31	30	29	32	31	31	29	33
Sodium**	45	39	23	15	20	21	19	18	26	24	24	18	24
% Sodium**	43	43	37	31	35	36	34	34	39	37	38	33	37
Electrical Conductivity***	473	421	301	249	281	289	271	268	320	305	306	263	312
Electrical Conductivity	537	440	314	248	308	290	283	293	357	335	338	278	335
pH	7.8	7.9	8.0	8.2	8.2	8.1	8.2	8.2	8.3	8.3	8.3	7.8	8.1
Boron	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.2
Fluoride	0.1	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.00
Iron	0.05	0.03	0.02	0.09		0.07	0.02	0.00	0.52	0.02	0.03	0.03	0.08
Manganese	0.01	0.00	0.03	0.01	0.02	0.02	0.01	0.01	0.03	0.00	0.03	0.01	0.02
Magnesium	15	13	13	7	9	8	9	10	16	16	17	9	12
Copper	0.01	0.01	0.00	0.02	0.01	0.02	0.01	0.01	0.03	0.02	0.01	0.01	0.01
Calcium	21	22	22	12	17	16	16	16	23	25	28	15	19
Zinc	0.02	0.02	0.01	0.02	0.02	0.03	0.02	0.01	0.02	0.02	0.01	0.01	0.02
Phenol		0.002							0.003				0.003
Color(units)	25	30	25	20	20	25	20	5	15	5	5	15	18
Sampling Date	01/14	02/18	03/18	04/15	05/20	06/17	07/15	08/19	09/16	10/14	11/18	12/16	

1/ August and September data are lab values. EC recorder malfunctioned.

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 25: CALIFORNIA AQUEDUCT ENTRANCE TO O'NEILL FOREBAY
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	372	275	206	161	169	177	169	165	181	156	141	154	194
Total Hardness**	151	115	80	67	69	72	69	68	73	65	60	65	80
Chlorides**	83	57	43	30	32	34	32	31	36	28	24	28	38
Sulfates**	80	54	35	26	28	29	28	27	30	25	23	25	34
Sodium**	70	48	36	25	27	29	27	26	30	24	20	23	32
% Sodium**	50	48	50	45	46	47	46	45	47	44	42	44	46
Electrical Conductivity***	605	456	351	271	285	299	286	279	306	261	236	259	325
Electrical Conductivity	527	455	364	292	279	294	272	305	316	260	237	276	323
pH	7.6	7.8	7.8	7.9	7.5	8.0	7.9	8.0	8.1	8.2	8.1	7.8	7.9
Boron	0.1	0.2	0.3	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.2
Fluoride	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.002	0.002	0.002	0.002	0.003	0.001	0.002	0.00
Iron	0.07	0.02	0.03	0.10		0.02	0.01	0.01	0.21	0.02	0.01	0.04	0.05
Manganese	0.01	0.01	0.00	0.01	0.03	0.01	0.00	0.00	0.02	0.00	0.00	0.01	0.01
Magnesium	14	13	11	8	8	9	8	10	10	9	8	9	10
Copper	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Calcium	20	23	20	14	15	16	15	17	15	14	14	15	17
Zinc	0.03	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0.01	0.02	0.02
Phenol		0.005							0.000				0.003
Color (units)	25	20	20	35	25	25	15	20	10	15	15	10	20
Sampling Date	01/15	02/19	03/19	04/16	05/21	06/18	07/16	08/20	09/17	10/15	11/19	12/17	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 26: CALIFORNIA AQUEDUCT AT CHECK 13
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	309	301	199	182	186	246	245	205	196	174	183	186	218
Total Hardness**	115	114	80	74	76	95	95	82	79	72	75	76	86
Chlorides**	85	82	41	36	37	57	57	43	40	33	36	37	49
Sulfates**	55	54	36	34	34	42	41	37	35	32	34	34	39
Sodium**	60	58	34	31	32	45	45	36	34	29	31	32	39
% Sodium**	53	53	48	47	48	51	51	49	48	47	47	48	49
Electrical Conductivity***	545	532	341	311	318	424	422	352	336	296	313	318	376
Electrical Conductivity	544	569	332	344	329	432	447	327	334	291	300	297	379
pH	7.6	7.9	7.9	7.9	8.0	8.3	7.7	8.0	8.5	8.0	8.4	8.2	8.0
Boron	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.2
Fluoride	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.001	0.001	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.01	0.00	0.003	0.002	0.002	0.002	0.002	0.000	0.002	0.00
Iron	0.07	0.06	0.08	0.05	0.09	0.04	0.02	0.06	0.04	0.02	0.04	0.06	0.05
Manganese	0.02	0.01	0.02	0.01	0.02	0.02	0.01	0.00	0.01	0.01	0.02	0.01	0.01
Magnesium	14	15	9	9	8	12	13	9	10	10	9	9	11
Copper	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01
Calcium	23	28	17	16	16	19	19	17	16	16	17	16	18
Zinc	0.03	0.01	0.00	0.00	0.01	0.02	0.01	0.02	0.01	0.01	0.02	0.01	0.01
Phenol		0.008							0.006				0.007
Color(units)	10	25	25	20	20	15	5	10	10	10	10	15	15
Sampling Date	01/15	02/19	03/19	04/16	05/21	06/18	07/16	08/20	09/17	10/15	11/19	12/17	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 27: CALIFORNIA AQUEDUCT NEAR KETTLEMAN CITY
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	337	337	239	203	179	249	259	226	200	185	188	191	233
Total Hardness**	127	127	95	82	73	98	102	90	80	75	76	77	92
Chlorides**	91	91	50	41	36	53	55	47	41	37	38	39	51
Sulfates**	61	61	44	38	33	46	48	42	37	34	35	35	43
Sodium**	64	64	41	34	29	43	45	39	33	31	31	32	41
% Sodium**	53	52	49	48	47	49	49	48	48	47	47	47	49
Electrical Conductivity***	571	570	409	343	298	428	446	385	336	309	314	321	394
Electrical Conductivity	535	565	362	304	316	370	423	375	324	294	298	314	373
pH	7.6	7.8	8.0	8.0	8.0	8.7	7.8	7.9	8.7	7.9	8.6	8.4	8.1
Boron	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2
Fluoride	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.0	0.2	0.2	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.002	0.002	0.0002	0.002	0.002	0.000	0.002	0.00
Iron	0.05	0.04	0.07	0.02	0.07	0.12	0.04	0.02	0.06	0.07	0.06	0.06	0.06
Manganese	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.00
Magnesium	14	16	11	9	8	10	12	10	10	10	10	9	11
Copper	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Calcium	22	27	19	15	16	18	19	17	16	16	17	17	18
Zinc	0.03	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.01
Phenol		0.006							0.003				0.005
Colcr(units)	20	15	30	25	25	10	10	10	5	10	10	10	15
Sampling Date	01/15	02/19	03/18	04/16	05/21	06/18	07/16	08/20	09/17	10/15	11/19	12/17	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 28: COASTAL BRANCH AT CHECK 5
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	308	311	238	199	194	236	251	217	204	189	187	197	228
Total Hardness**	124	113	90	77	75	89	94	83	78	73	73	76	87
Chlorides**	82	85	54	38	36	53	60	45	40	34	33	37	50
Sulfates**	52	49	41	37	36	41	42	38	37	35	35	36	40
Sodium**	57	59	41	32	31	41	44	36	33	30	30	32	39
% Sodium**	50	53	50	48	48	50	51	49	48	47	47	48	49
Electrical Conductivity***	538	530	392	319	310	388	416	352	327	300	297	316	374
Electrical Conductivity	539	553	375	359	311	395	423	393	334	296	302	340	385
pH	7.7	8.3	7.9	7.6	7.5	7.6	7.6	7.6	7.8	7.8	9.0	7.8	7.9
Boron	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2
Fluoride	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.08	0.05	0.08	0.01	0.10	0.03	0.02	0.04	0.08	0.16	0.04	0.06	0.06
Manganese	0.00	0.01	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.01
Magnesium	14	15	10	9	11	12	10	10	10	9	10	13	11
Copper	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.00	0.02	0.02	0.01	0.04	0.02
Calcium	24	29	22	19	17	19	22	21	18	17	14	16	20
Zinc	0.06	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.03	0.02	0.02	0.03	0.02
Phenol		0.005							0.003				0.004
Color (units)													0
Sampling Date	01/14	02/18	03/18	04/15	05/20	06/17	07/15	08/19	09/16	10/14	11/18	12/16	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 29: CALIFORNIA AQUEDUCT AT CHECK 29
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	365	345	245	195	192	253	289	250	215	207	212	212	248
Total Hardness**	134	124	93	76	75	95	107	94	82	80	81	81	93
Chlorides**	100	93	56	37	37	59	72	58	45	42	44	44	57
Sulfates**	74	59	39	30	29	41	48	40	34	32	33	33	41
Sodium**	71	65	42	31	30	44	52	43	35	34	35	35	43
% Sodium**	54	53	50	47	47	50	51	50	48	48	48	48	49
Electrical Conductivity***	612	596	405	309	304	420	489	414	347	333	341	341	409
Electrical Conductivity	576	568	443	377	300	399	412	409	324	304	308	326	396
pH	7.7	7.8	7.8	8.0	7.6	7.7	7.7	7.9	7.7	7.9	8.0	7.8	7.8
Boron	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2
Fluoride	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.09	0.05	0.09	0.05	0.14	0.04	0.03	0.04	0.13	0.06	0.08	0.05	0.07
Manganese	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	14	16	11	11	10	12	12	10	10	9	9	11	11
Copper	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.03	0.01	0.01	0.01	0.02
Calcium	24	29	25	21	17	19	19	21	17	18	17	16	20
Zinc	0.04	0.02	0.01	0.02	0.02	0.01	0.00	0.01	0.04	0.01	0.03	0.03	0.02
Phenol		0.019							0.000				0.010
Color (units)	21	17	26	16	14	5	6	4	6	6	6	5	11
Sampling Date	01/14	02/18	03/18	04/15	05/20	06/17	07/15	08/19	09/16	10/14	11/18	12/16	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 30: CALIFORNIA AQUEDUCT AT TEHACHAPI AFTERBAY
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	318	318	305	202	165	213	256	231	198	185	182	191	230
Total Hardness**	129	119	115	81	68	85	99	91	80	75	74	77	91
Chlorides**	94	83	79	42	30	46	61	52	41	37	35	38	53
Sulfates**	66	57	55	32	25	35	44	38	32	29	28	30	39
Sodium**	68	60	57	34	26	36	46	40	33	30	29	31	41
% Sodium**	53	52	52	47	45	48	50	49	47	46	46	47	49
Electrical Conductivity***	588	551	527	338	272	358	437	390	331	308	302	318	393
Electrical Conductivity	589	570	551	158	300	410	457	384	336	323	325	336	395
pH	7.6	8.1	8.3	7.9	7.6	8.0	7.6	7.8	7.9	7.7	8.0	7.6	7.8
Boron	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2
Fluoride	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium													
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.03	0.02	0.02	0.04	0.06	0.04	0.02	0.01	0.01	0.03	0.26	0.01	0.05
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00
Magnesium	14	16	16	3	8	11	11	11	10	10	9	10	11
Copper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium	24	26	28	11	17	21	22	18	18	17	17	18	20
Zinc	0.01	0.01	0.01	0.03	0.00	0.00	0.02	0.01	0.02	0.01	0.02	0.00	0.01
Phenol													
Color (units)	20	6	10	6	5	5	8	4	8	5	10	5	8
Sampling Date	01/16	02/19	03/19	04/16	05/21	06/18	07/16	08/20	09/17	10/15	11/19	12/17	

1/ January data are lab values. Aqueduct was dewatered.

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 31: PYRAMID LAKE AT ENTRANCE TO ANGELES TUNNEL
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	323	310	307	351	262	280	261	220	270	245	262		281
Total Hardness	118	142	131	145	112	108	110	104	102	100	95		115
Chlorides	89	90	86	85	62	53	56	64	60	56	52		68
Sulfates	44	60	58	71	56	52	52	44	41	40	38		51
Sodium	62	63	62	62	48	41	44	47	44	42	40		50
% Sodium	52	48	50	47	48	44	46	49	47	47	47		48
Electrical Conductivity	544	595	566	586	449	411	429	439	425	417	392		478
pH	8.0	8.2	8.0	8.1	8.1	8.2	8.2	8.2	8.1	7.8	7.7		8.1
Boron	0.2	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2		0.2
Fluoride	0.3	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.2		0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Selenium	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.00
Hexavalent Chromium													
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Iron	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00		0.00
Manganese	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01		0.00
Magnesium	14	17	16	17	12	13	12	13	12	12	11		14
Copper	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.02	0.00	0.00		0.00
Calcium	24	29	26	30	25	22	24	20	21	20	20		24
Zinc	0.02	0.00	0.00	0.01	0.03	0.01	0.00	0.01	0.01	0.00	0.01		0.01
Phenol													
Color (units)	4	4	5	4	4	6	2	4	3	3	3		4
Sampling Date	01/14	02/18	03/18	04/15	05/20	06/16	07/14	08/18	09/15	10/22	11/20	12/17	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 32: CASTAIC LAKE AT OUTLET WORKS
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	290	276	249	300	284	326	328	280	315	303	305	305	297
Total Hardness	120	124	124	129	132	140	136	142	145	142	136	132	134
Chlorides	56	62	61	70	65	70	71	73	75	70	68	65	67
Sulfates	60	59	60	60	65	68	72	76	72	70	70	64	66
Sodium	47	50	48	52	52	51	55	56	56	54	54	50	52
% Sodium	45	46	45	46	46	43	46	45	45	45	45	45	45
Electrical Conductivity	473	460	490	496	501	519	535	536	550	573	526	505	514
pH	8.0	8.0	8.1	8.3	8.6	8.7	8.7	8.6	8.3	7.9	8.0	8.1	8.3
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.2
Fluoride	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium													
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	12	13	13	15	15	17	16	17	17	15	15	15	15
Copper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium	28	28	28	27	28	28	28	29	30	32	30	28	29
Zinc	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01
Phenol													
Color(units)	3	3	3	4	3	5	4	5	5	2	1	5	4
Sampling Date	01/13	02/18	03/18	04/14	05/19	06/16	07/14	08/18	09/15	10/14	11/17	12/16	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 33: CALIFORNIA AQUEDUCT AT CHECK 59
1986

Constituents	JAN	FEB	MAR	APR 1/	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	362	303	309	350	162	213	256	229	197	188	175	187	244
Total Hardness**	130	117	118	145	69	87	101	92	81	78	73	78	97
Chlorides**	108	78	80	84	31	48	62	53	42	39	35	39	58
Sulfates**	101	59	61	81	26	37	47	41	33	31	29	31	48
Sodium**	79	60	61	67	27	38	48	42	35	33	30	32	46
% Sodium**	57	53	53	49	46	49	51	50	48	48	47	48	50
Electrical Conductivity***	652	537	548	599	276	370	449	400	340	324	300	323	426
Electrical Conductivity	647	565	589	599	312	396	446	446	346	325	302	336	442
pH	7.6	8.0	8.8	8.3	7.6	8.0	7.6	7.5	7.7	7.8	7.6	7.9	7.9
Boron	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2
Fluoride	0.3	0.2	0.2	0.3	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium													
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.03	0.01	0.00	0.00	0.09	0.02	0.16	0.00	0.03	0.02	0.00	0.00	0.03
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.00	0.00
Magnesium	15	16	16	17	7	12	11	13	9	9	8	11	12
Copper	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00
Calcium	26	26	30	30	19	21	22	20	19	19	17	18	22
Zinc	0.02	0.04	0.01	0.02	0.01	0.00	0.01	0.01	0.10	0.01	0.01	0.00	0.02
Phenol													
Color(units)	20	7	8	5	4	6	5	4	6	5	13	4	7
Sampling Date	01/15	02/19	03/19	04/16	05/21	06/18	07/16	08/20	09/17	10/15	11/19	12/17	

1/ October and November data are lab values. The EC recorder malfunctioned.

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 34: CALIFORNIA AQUEDUCT AT INLET TO MOJAVE SIPHON
1986

Constituents	JAN	FEB	MAR 1/	APR 1/	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	331	281	316	333	177	197	229	257	279	335	325	386	287
Total Hardness**	121	109	136	144	75	82	91	102	108	122	120	135	112
Chlorides**	97	76	82	85	35	44	55	65	74	98	94	123	77
Sulfates**	73	48	70	74	28	32	37	51	57	74	71	92	59
Sodium**	70	54	64	64	30	35	41	51	56	71	68	85	57
% Sodium**	56	52	50	48	47	48	49	52	53	56	55	58	52
Electrical Conductivity***	597	495	580	581	303	341	398	465	504	604	587	697	513
Electrical Conductivity	668	562	580	581	286	387	448	435	345	326	305	335	438
pH	7.8	8.1	8.8	8.4	7.7	8.0	7.6	7.5	8.0	7.9	7.7	8.0	8.0
Boron	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.2
Fluoride	0.2	0.2	0.2	0.3	0.1	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium													
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.03	0.02	0.00	0.00	0.10	0.02	0.02	0.00	0.01	0.02	0.03	0.00	0.02
Manganese	0.00	0.11	0.01	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.01	0.00	0.06
Magnesium	16	15	16	18	7	15	12	13	10	10	8	10	13
Copper	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Calcium	26	26	28	28	17	14	22	19	18	18	17	19	21
Zinc	0.01	0.02	0.00	0.01	0.01	0.00	0.00	0.07	0.03	0.00	0.02	0.02	0.02
Phenol													
Color (units)	15	6	11	5	6	6	16	4	5	5	12	3	8
Sampling Date	01/15	02/19	03/19	04/16	05/21	06/18	07/16	08/20	09/17	10/15	11/19	12/17	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 35: SILVERWOOD LAKE AT OUTLET TO MOJAVE RIVER
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	372	322	294	285	228	228	274	198	227	204	192	213	253
Total Hardness	112	121	115	115	94	92	104	97	97	92	86	92	101
Chlorides	102	99	90	89	61	54	63	64	57	53	42	42	68
Sulfates	40	44	46	45	39	41	44	38	34	33	27	31	39
Sodium	70	67	63	62	45	40	46	46	41	38	33	31	49
% Sodium	56	53	53	53	51	48	48	50	47	46	45	41	49
Electrical Conductivity	582	585	543	527	397	381	424	427	394	377	329	330	441
pH	7.9	8.1	7.8	8.0	8.1	8.1	7.8	7.9	8.0	7.8	7.9	8.0	8.0
Boron	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2
Fluoride	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.1	0.2	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium													
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	14	16	14	14	12	11	13	12	12	11	10	11	13
Copper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Calcium	22	22	23	23	18	19	20	19	19	19	18	19	20
Zinc	0.01	0.03	0.00	0.01	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.01
Phenol													
Color(units)	4	4	5	4	5	6	5	5	5	6	4	3	5
Sampling Date	01/15	02/20	03/18	04/15	05/20	06/17	07/14	08/19	09/16	10/15	11/19	12/18	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample

TABLE 36: SILVERWOOD LAKE AT INLET TO SAN BERNARDINO TUNNEL
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	306	356	276	267	234	221	242	248	233	238	202	211	253
Total Hardness	108	114	111	115	97	92	98	100	97	94	86	86	100
Chlorides	97	93	84	87	62	52	61	65	59	53	44	43	67
Sulfates	37	41	42	43	39	39	43	39	35	33	28	30	37
Sodium	66	63	60	60	45	38	45	47	43	38	35	33	48
% Sodium	56	54	53	52	50	46	49	49	48	46	46	45	50
Electrical Conductivity	554	532	519	519	403	370	422	442	402	386	335	330	435
pH	7.9	8.0	8.1	8.2	8.2	8.0	7.8	7.8	8.1	7.8	8.0	8.0	8.0
Boron	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2
Fluoride	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium													
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.00	0.00	0.00	0.01	0.01	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.01
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	13	15	13	14	12	11	11	11	12	12	10	10	12
Copper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium	22	21	23	23	19	19	21	22	19	18	18	18	20
Zinc	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01
Phenol													
Color(units)	4	4	7	4	2	6	5	3	5	5	4	4	4
Sampling Date	01/15	02/20	03/18	04/15	05/20	06/17	07/14	08/19	09/16	10/15	11/19	12/18	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 37: DEVIL CANYON AFTERBAY
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	299	297	288	286	238	211	229	240	226	211	195	194	243
Total Hardness**	120	113	111	110	95	85	91	95	91	85	80	80	96
Chlorides**	82	82	79	78	59	48	55	59	54	48	41	41	61
Sulfates**	46	50	48	48	38	33	37	39	36	33	30	30	39
Sodium**	59	58	56	55	43	36	41	43	40	36	32	32	44
% Sodium**	51	53	52	52	50	48	49	50	49	48	47	47	50
Electrical Conductivity***	528	533	516	512	416	362	398	420	393	362	330	329	425
Electrical Conductivity	561	536	527	522	415	371	420	458	402	385	338	334	439
pH	7.8	8.1	7.7	8.1	7.7	8.0	7.4	7.4	8.0	7.8	7.7	8.0	7.8
Boron	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2
Fluoride	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium													
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.01
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.11	0.00	0.00	0.00	0.00	0.01
Magnesium	13	15	13	14	11	10	9	13	11	11	9	10	12
Copper	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Calcium	22	22	23	22	20	20	22	20	20	19	18	18	21
Zinc	0.00	0.01	0.00	0.03	0.01	0.00	0.02	0.02	0.02	0.00	0.00	0.01	0.01
Phenol													
Color (units)	3	4	7	5	3	6	5	3	3	5	5	4	4
Sampling Date	01/15	02/20	03/19	04/16	05/21	06/18	07/16	08/20	09/17	10/15	11/19	12/17	

1/ October and November data are lab values. The EC recorder was out of service.

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 38: LAKE PERRIS AT INLET
1986

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	219	189	176	170	183	240	206	223	220	209	202	223	205
Total Hardness	74	84	78	76	78	82	80	84	84	86	81	84	81
Chlorides	41	46	45	47	50	51	51	52	54	54	53	51	50
Sulfates	34	34	34	33	34	35	35	37	35	36	34	37	35
Sodium	36	36	37	39	40	40	41	41	41	40	42	40	39
% Sodium	50	47	50	52	52	50	51	50	50	49	52	50	50
Electrical Conductivity	332	327	345	344	350	357	364	366	374	377	368	364	356
pH	8.0	8.1	7.8	8.1	8.1	8.1	7.9	8.0	8.0	7.6	7.9	8.0	8.0
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Fluoride	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.1	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium													
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	9	12	10	10	10	12	11	12	12	13	10	13	11
Copper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Calcium	15	14	15	14	15	13	14	14	14	13	16	12	14
Zinc	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Phenol													
Color(units)		3	2	3	2	5	3	3	1	4	4	2	3
Sampling Date	01/14	02/18	03/17	04/14	05/19	06/16	07/14	08/19	09/16	10/14	11/18	12/17	

* Specific Conductance is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 39: WATER QUALITY
MINIMUM DETECTION CONCENTRATIONS FOR TESTED SUBSTANCES*

CHLORINATED HYDROCARBON PESTICIDES AND PCB's

	Detection Limits (ppm or mg/liter)
Alachlor	.00001
Aldrin	.00001
Atrazine and/or Simazine	.00001
BHC	.00001
Captan	.00001
Chlordane	.00001
Chlorpropham	.00001
Dacthal	.00001
DDD	.00001
DDE	.00001
DDT	.00001
Dicofol	.00001
Dieldrin	.00001
Difolatan	.00001
Diuron	.00001
Endosulfan	.00001
Endrin	.00001
Heptachlor	.00001
Heptachlor Epoxide	.00001
Lindane	.00001
Methoxychlor	.00002
Nitrofen	.00001
PCB 1016	.00025
PCB 1242	.00025
PCB 1254	.00025
PCB 1260	.00025
Perthane	.00001
Pronamide	.00001
Propanil	.00001
Toxaphene	.00025

ORGANIC PHOSPHORUS PESTICIDES

	Detection Limits (ppm or mg/liter)
Bidrin	.00001
Carbophenthion	.00001
Crufomate	.00010
Demeton	.00001
Diazinon	.00001
Dioxathion	.00001
Dursban	.00001
Ethion	.00001
Ethyl Parathion	.00001
Fenthion	.00002
Malathion	.00001
Methidathon	.00001
Methyl Parathion	.00001
Paraoxon	.00001
Phorate	.00003
Phorate Sulfone	.00001
Phosmet	.00001

HERBICIDES AND FUNGICIDES

2,4-D + esters & salts	.00001
2,4,5-T + esters & salts	.00001
2,4,5-TP/Silvex + esters & salts	.00001
MCPA	.00001
Pentachlorophenol	.00001
Tetrachlorophenol	.00001

MISCELLANEOUS COMBINATIONS

CDEC	.00001
Thiobencarb	.00001

* Listed are those pesticides that would be detected by lab scans currently used for pesticide analysis, and the minimum concentration at which these substances can be detected. Detected amounts from the quarterly sampling program are shown below:

PESTICIDES IN THE CALIFORNIA AQUEDUCT 1986

STATION	FEB	MAY	AUG	NOV
BANKS DELTA PUMPING PLANT				
Chlorinated Hydrocarbons				
Atrazine/Simazine	0.00014	0.00007		
Unknowns	0.00001 2/	0.00009 2/		
Organic Phosphorous	1/			
Phenoxy Acid Herbicides				
Miscellaneous				
O'NEILL PUMPING PLANT DISCHARGE				
Chlorinated Hydrocarbons			Pesticide sampling in the SWP was suspended for the rest of the year for upgrading equipment and analysis techniques at DWR's Bryte Lab. Sampling resumed in February, 1987.	
Atrazine/Simazine	0.00033	0.00002		
Organic Phosphorous	1/			
Unknowns		0.00002 2/		
Phenoxy Acid Herbicides				
2, 4-D	0.00002	0.00005		
Miscellaneous				
NEAR KETTLEMAN CITY (CHECK 21)				
Chlorinated Hydrocarbons				
Atrazine/Simazine	0.00016	0.00006		
Unknowns		0.00002 2/		
Dacthal	0.00026			
Organic Phosphorous	1/			
Phenoxy Acid Herbicides				
2, 4-D	0.00004	0.00010		
Miscellaneous				
TEHACHAPI AFTERBAY				
Chlorinated Hydrocarbons				
Atrazine/Simazine		0.00006		
Unknowns	0.00003 2/	0.00002 2/		
Organic Phosphorous	1/			
Phenoxy Acid Herbicides				
Miscellaneous				

1/ Not tested this date.

2/ Does not exceed Maximum Contaminant Level of drinking water standards or Department of Health Services (DOHS) Action Level.

NOTE: Concentrations are below minimum detection level unless shown otherwise.